Language Practices in Multilingual Ecologies during Mathematics Instruction

By

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Dedication

I dedicate this dissertation to my family, who love me unconditionally and who are my source for love, laughter and perseverance.

Dedico esta tesis a mis padres, quienes me han apoyado en todo momento y quienes forjaron mi ser a través de su amor, paciencia y consejo. Los amo.

Dedico esta tesis a mis hermanos. Ismael, gracias por ser segundo padre para mis hijos y por tu apoyo y ayuda. Te amo. Gabi y Dani, les dedico esta tesis a ustedes y a sus familias, quienes me apoyan sin importer tiempo ni distancias. Los amo.

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Chapter 1: Introduction

Overview

No Child Left Behind (2001) requires all students to meet academic measures of achievement objectives and, starting in 3rd grade, language arts and mathematics become benchmarks for schools to show progress. Not only do mathematics scores play a critical role in the measurement of academic achievement of students, but they also have been considered a gatekeeper to economic access, full citizenship, and higher education (Professional Standards for Teaching Mathematics, 1991; Assessment Standards for School Mathematics, 1995; Principles and Standards for School Mathematics, 2000; and the Curriculum and Evaluation Standards for School Mathematics, 1989). For emerging bilingual[1] students, specifically Latinos, who have historically been underrepresented in technical and scientific fields (Moschkovich, 2002), academic success in mathematics presents a double challenge-that of accessing and participating in the learning of the content of mathematics and that of acquiring the language practices and skills to participate meaningfully in learning mathematics. While these challenges exist for all emerging bilinguals, those in rural districts lack the supports and resources that urban districts possess.

[1] I have chosen to use the term of emerging bilinguals to describe individuals who use two or more languages. Other terms, like English language learners, label individuals based on the language to be learned, represent a deficit view, and disregard the fact that these individuals may continue to function in their home language in other contexts (García, Kleifgen & Falchi, 2008). On the other hand, the term bilingual counters the monolingual lens used to describe these individuals and is inclusive of home language practices. Emerging bilinguals has been used to "emphasize the development of bilingual competencies in children whose native language is other than English" (Escamilla et al., 2014, p. 5) and provides a counter narrative to the deficit view created around the term English language learners. In this study, I use the term emerging bilinguals to represents the dynamic nature of language development of students and educators and to move the conversation away from stages or levels of proficiency into a paradigm of constant movement, growth and development. I use it to describe not only students who are learning English as an additional language, but also students who are learning Spanish as a second language and their educators.

Since a lot of existing research on the education of emerging bilinguals focuses on program models and on high stake content learning, I have chosen to center my study on language. My study investigates how emerging bilinguals, including students and their teachers, use and move across languages during mathematics instruction. In depth understanding of language use contributes to the literature that sees emerging bilinguals' experiences and languages as assets in teaching and learning.

Statement of the problem

Educators[2] in the United States have long searched for and explored various program models in order to support the academic achievement of emerging bilinguals, who are the fastest-growing student population in the United States (NCES, 2010). According to the Urban Institute's Immigration Studies Program, by 2015, children of immigrants may constitute 30% of the school population (Honigsfeld, 2009, p. 167). Many of these students may not be newcomers to the US, but may be US-born (BUENO Policy Center, 2014; US Department of Education, 2011). About 80% of these students speak Spanish in the home (US Department of Education, 2011). As schools think of effective practices to support the education of emerging bilinguals, bilingual education has been one of the program models embraced by schools and districts across many states. For emerging bilinguals, the development of Spanish language in academic contexts provides a venue for educational equity as well as a way to connect home and school language and learning practices.

[2] I have chosen to use the term educator to capture the fact that in many current educational settings, there may be more than one adult in the classroom engaged in classroom activities. In some cases, specialists, para-educators or other adults may share the classroom space with the classroom teacher and the students.

Bilingual education became a controversial topic in education from the 1980s through the early 2000s (Baker, 2011; Cummins et al., 1984; Hoover, 1982; Krashen, 1996; Shin, 1994; Shing & Gribbons, 1996; Slavin & Cheung, 2005; Verhoeven, 1991; Wiley & Wright, 2004). Over the last decade, the popularity of bilingual programs has increased due, in part, to the rapidly shifting global landscape and the research that has shown the relationship between world language learning and academic achievement (Howard, Sugarman & Christian, 2003). As the global economy and global communications create rapid change in today's world's social systems and cultures, individuals need new tools to enhance their communication and intercultural understandings, and consequently, to be able to participate in these new global contexts. This reality and the research on world languages, which has shown significant correlation in studies to academic achievement, cognitive development and positive attitudes and beliefs toward others in terms of language learning and other cultures (Cunningham & Graham, 2000; D'Angiulli, Sieger & Serra, 2001; Pagan, 2005; Thomas & Collier, 2002; Turnbull, Hart & Lapkin, 2003), has increased general interest in bilingual education. English-speaking families have become increasingly interested in bilingual programs such as dual language education and two-way immersion programs. Thus these programs are expanding.

The interest in bilingual education from both Spanish-speaking families and families whose home language is English or another language has created a demand for bilingual programs where both English- and Spanish dominant emerging bilinguals can continue to develop both languages while learning academic content. The number of bilingual immersion schools in the US has grown in a relatively short time. In 2007, there were just over 250 schools in the country. By 2011, that number had increased to 448, according to the Center for Applied

Linguistics (2011). A large percentage of these programs have Spanish as the target language, probably because of the strong presence of Spanish speakers in the United States. Of all the languages represented in the United States, Spanish is the most spoken non-English language by both Hispanics and non-Hispanics (PEW Research Center, 2013).

While bilingual programs that educate emerging bilinguals from both Spanish and English language backgrounds have grown in popularity because of their goals of bilingualism, biliteracy, cross-cultural understanding, and high academic achievement (Lindholm-Leary, 2001), their design does not appear to provide equitable access to language as a resource for all of the emerging bilinguals enrolled in the program. In the past, the lack of effective tools to meet the needs of Latino emerging bilinguals, including their linguistic needs, caused a gap in academic achievement in mathematics between White and Latino students as well as an underrepresentation of Latino students in technical and scientific fields (Moschkovich, 2002). This academic achievement gap in mathematics between White and Latino students virtually remained the same, according to NAEP scores from 1990 to 2009, at both fourth and eighth grade levels (Hemphill & Vanneman, 2011).

More research is needed on effective practices that support the academic and linguistic success of emerging bilinguals in an equitable manner. Further, a better understanding of the way in which emerging bilinguals use their complete linguistic system to leverage their learning is needed to inform educational practices in bilingual classrooms. Finally, an in-depth look at program models and the practices that they support can illuminate their impact on the teaching and learning of emerging bilinguals.

Purpose of the study and research questions

The purpose of this study was to learn how language is used by emerging bilinguals in 4th and 5th grade classrooms where multiple languages are present. This research also investigates whether the ways in which emerging bilinguals use language increase opportunities for teaching and learning of mathematics. The focus on mathematics reflects its critical role in measuring academic achievement in the current era of standards and accountability. Similarly, the focus on 4th and 5th grade echoes the specific time when students' mathematics achievement impacts schools' accountability and when academic and linguistic demands increase for students. The questions guiding my research are:

1) What factors shape language use in multilingual classrooms during mathematics instruction?
2) What forms of language are employed in multilingual classrooms during mathematics instruction? When? By whom? For what purposes?
3) Does translanguaging occur in multilingual classrooms? If so, how might we understand it? Can we identify any impact of translanguaging on learning?

CHAPTER 2: REVIEW OF LITERATURE

The literature review in this thesis has two purposes. The first purpose is to discuss the theoretical stance used in this research. The review aims to provide a frame for terms and concepts that were used as a lens to understand the various interactions in the classrooms that were the foci of my study, and the use of language within them. The second purpose is to examine and integrate the existing research on mathematical learning and language use by emerging bilingual students. My intent is to critically analyze the existing research in order to identify central issues in the education of emerging bilinguals and to contextualize my research.

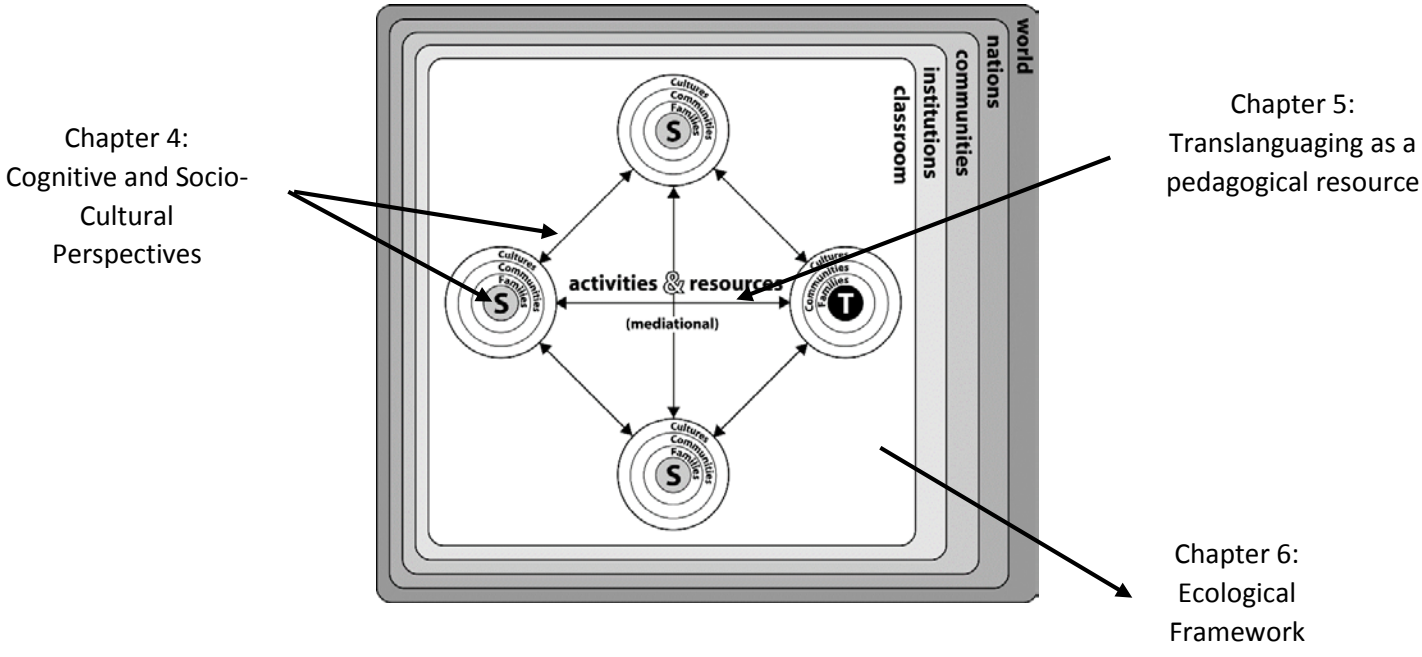
Theoretical framework

My theoretical stance in this study is premised on the belief that learning takes place through social interaction (Vygotsky, 1978). In elementary schools, many of these interactions take place in the classroom, which is a complex and dynamic system where students and teachers come with individual, family and group dynamics that impact the way they interact and learn with each other. In order to study the elements that mediate learning in classrooms, I have chosen to use an ecology framework. This framework affords me the examination of the relationship between participants within a system and is compatible with sociocultural theory of learning and language development through social interaction (Hawkins, 2004). I also use a lens of translanguaging (García, 2009) because I am particularly interested in studying classrooms where multiple languages are used in learning activities. I have specifically focused on mathematics instruction because of the current interest in it for accountability purposes and its role in academic achievement and cognitive development of children. Literature in

mathematics learning attends to the social interactions between learners, but it also highlights internal mental processes taking place as children "do math." In order to attend to these processes and analyze how translanguaging practices interact with those processes, I have added a cognitivistic lens (Bruner, 1990) to analyze some of the data collected.

In my analysis, I begin with individuals' cognitive processes and move outward to examine interactions among students and between students and their teachers. Since each system, including the individual, are "complex […] systems that include multiple, complex and often interdependent components and characteristics" (Hawkins, 2004, p. 15), the ecological framework helps bring all of the pieces in this study together focused on one goal, examining the social, linguistic and academic negotiations needed to participate in learning in the classroom.

Figure 1. Ecology framework (Hawkins, 2004)



In figure 1, I have used Hawkins' (2004) ecology framework as a visual way to situate the analysis of the different chapters in this thesis. In Chapter 4, I examine student-student interactions, using data about the classroom, the school, and the community to frame the interpretation of the specific interactions between students. In Chapter 5, the focus is on the student-teacher relationship, and the various resources used in the classroom. As in Chapter 4, data from school and district policies and about national trends in professional learning for bilingual schools help to contextualize the interpretation of the use of activities and resources in the classroom. Finally, in Chapter 6 I use the framework as a lens to view how the teacher affected the ecology of the classroom and how the ecology of the classroom impacted the teacher's actions.

Cognitivism

Cognitivism is a theoretical framework that became popular in the 1950s in the field of psychology as a response to behaviorism, which cognitivists claimed neglected to explain cognition (Mandler, 2002). From the cognitivistic perspective, each person has an individual profile of characteristics, abilities and challenges that result from predisposition, learning and development (Woolfolk, Winne & Perry, 2006). While from this perspective differences between individuals are assumed in intelligence, creativity, cognitive style, motivation and the capacity to process information, communicate, and relate to others, not all of these are relevant or applicable to this study. The view that applies to this study is that memory structures determine how information is perceived, processed, stored, retrieved and forgotten (Mayer, 2001). Of particular interest in this study is the role of memory in mathematical

performance because of its proven impact on mathematical development (Alloway & Passonunghi, 2011; Holmes & Adams, 2006; Raghubar et al., 2010).

Working memory refers to the ability to hold information in memory while simultaneously processing other information (Baddeley, 1992; Engle et al., 1999; Just & Carpenter, 1992) and it has been shown to be a significant predictor of students' academic achievement in mathematics and other areas (Berg, 2008; Geary et al., 2007; Jarvis & Gathercole, 2003). While much of the prior research on mathematical problem solving has been through the cognitive tradition (Carpenter et al., 1993; Carpenter et al., 1999; Carpenter, Hievert & Moser, 1981), this perspective alone has not afforded the opportunity to examine the cultural and linguistic knowledge and experiences that support emerging bilinguals' participation in the mathematics classroom (Gonzalez et al., 2001; Moschkovich, 2002, 2010; Pattichis, 2012). For this reason, I have chosen to use the socio-cultural perspective along with the cognitive perspective.

Sociocultural Theories

The sociocultural perspective affords examination of how emerging bilinguals leverage their social and cultural repertoires in learning mathematics. In particular, it enables a focus on how language practices are used to negotiate mathematical learning. Research from the socio-cultural perspective has shown how the multiple views and multiple meanings of representations are negotiated through conversations among emerging bilinguals (Moschkovich, 2002, Pattichis, 2012). Further, research has captured the complex ways that

students use formal and everyday language, home language, and code switching[3] to show mathematical reasoning (Setati et al., 2002). In this research, while the cognitive perspective will illuminate how this use of translanguaging also impacts emerging bilingual students' mathematical processing, the sociocultural perspective will help to capture the complex ways in which these students use translanguaging.

From a socio-cultural perspective, social interaction is the key in the construction of knowledge, understanding and learning (Mercer, 1996, Resnick, 1987, 1991; Wells, 2007). While cognitive perspectives focus on internal processes, socio-cultural perspectives focus on the external, on interactions during learning that shape students' language use and language acquisition. My goal is to examine some of the practices around language use from both perspectives, not only to better understand the role of language in learning and doing math, but also to better understand the factors that impact how language is used and maximized in designing learning environments and opportunities for emerging bilinguals.

Mathematical learning

Most of the traditional literature related to mathematical learning has focused on attending to student thinking (Carpenter et al., 1989, Franke et al., 2009; Kazemi & Franke, 2004; van Es & Sherin, 2010) through cognitive perspectives. An area of interest, for example, has been identifying the factors that are critical in developing mathematical thinking, like early

[3] Code switching is also written code-switching and codeswitching. I have maintained the original spelling in quotations and references. However, my preference is to spell code switching as two words and I have used that spelling in my own arguments and claims throughout this thesis.

mathematical knowledge (De Smedt, Verschaffel & Ghesquiere, 2009; Jordan et al., 2007; Purpura et al., 2013). Since mathematical skills develop as a progression of interrelated facts and concepts (Baroody, 2003; Gersten & Chard, 1999; National Mathematics Advisory Panel [NMAP], 2008), advanced mathematical knowledge is believed to be dependent on the acquisition of more basic knowledge. From the cognitive tradition, the use of specific strategies in problem solving has also been of interest (Carpenter et al., 1993; Carpenter et al., 1999; Carpenter, Hiebert & Moser, 1981). While these studies have contributed to expanding our understanding of how children learn math, it has kept the unique resources and funds of knowledge that children from diverse backgrounds bring to school outside of the conversation. Other non-mathematical factors that have also been researched due to their impact on mathematical development include working memory (Alloway & Passonunghi, 2011; Holmes & Adams, 2006; Raghubar et al., 2010) and language (Fuchs et al., 2005, 2008, 2010; Hufferd-Ackles, Fuson & Sherin, 2004; Mestre, 1988; O'Connor, 1988; Purpura et al., 2011; Sfard, 2000, 2001). This body of research has focused mainly on mathematical discourse that is part of being socialized into mathematical thinking and learning. However, much of this research has lacked a focus on diverse students, specifically emerging bilinguals. This absence has resulted in educators in the mainstream (e.g., not professionally prepared to teach emerging bilinguals) not having proper pedagogical tools to include cultural and linguistic knowledge and experiences from diverse learners, resulting in decreased opportunities for participation of these students (González et al., 2001; Moschkovich, 2002, 2010; Pattichis, 2012). Such research has also masked other issues within local ecologies, such as diverse students' access to courses or experienced teachers (Wager & Foote, 2013).

On the other hand, socio-cultural research has opened new doors. Sociolinguists who have focused on the social nature of language contend that language is cognitive, but also cultural, social and situated. In other words, language use depends on what is understood to be appropriate in a given social setting and in a group's collective linguistic norms, and not on individual psyche (Hakuta & McLaughlin, 1996). This has allowed the inclusion of ecological characteristics, including students' cultural and linguistic ways of knowing and of learning.

Specifically in mathematics, issues of equity and diversity within mathematics education are receiving increased interest (Khisty & Chval, 2002; Wager & Foote, 2013). Some research has focused on the funds of knowledge that emerging bilinguals bring to the math classroom (González et al., 2001), while other research has begun to examine the role of emerging bilinguals' language in learning mathematics (Domínguez, 2005; Moschkovich, 1999, 2002, 2007a, 2007b 2010; Setati, 2005; Setati et al., 2002). Some of the earlier research focused on the role of language proficiency in mediation of cognitive functioning. While focusing on emerging bilinguals, this research was concerned with the syntax and use of language in mathematics (Mestre, 1988) or with precise math terminology (Spanos et al., 1988) more than with the ecology of mathematical learning. However, more recent research has begun to problematize this view of language and turn to the exploration of mathematical discourse, defining discourse, in a broader sense, as ways of speaking, being, thinking and interacting (Gee, 1996). Gee differentiates this definition of discourse from earlier traditional perspectives through the use of a capital D. Using the concepts of Discourse (Gee, 1996, 1999; Halliday, 1978, Cazden, 1986, 1993; Mehan, 1979), second language acquisition (Bialystok, 2001; Hakuta & Cancino, 1977) and bilingualism (Valdés-Fallis, 1978, Zentella, 1997), other research

examined more complex issues of discourse, like code switching (Moschkovich, 1999, 2002, 2007b), and included teachers' discourse (Adler, 1998; Setati, 1998; Setati & Adler, 2001). Studies related to code switching defines it as a communicative strategy, in which emerging bilinguals shuttle between languages and modalities, used to negotiate meanings in rural and urban contexts (Canagarajah, 2011). Nevertheless, through this research, language was reduced to "a tool, whereas discourse [represents] a broader activity in which the tool is used" (Gutiérrez, Sengupta-Irving & Dieckmann, 2010, pp.45-46). In other words, code switching, in those studies, was recognized as the vehicle for communication and not as a form of Discourse. Discourse, from this perspective, represents the connection between saying, doing and being, which allows us to take on different roles and socially significant identities (Gee, 1999). Code switching as Discourse, then, is broader than the sum of all the words used and has a broader purpose than communication. Instead, it may render significance to situations, represent particular views, identities and practices, build relationships and connections, and even symbolize particular language ideologies.

The research represented in this thesis draws on the sociocultural view that learning takes place within an ecological space, where multiple and complex relationships develop and where language use by emerging bilinguals is viewed as Discourse. In other words, I view the use of language by emerging bilinguals as a way not only to communicate, but also to represent, build and symbolize their practices and identities during mathematics instruction. Using this view of language as Discourse affords me the opportunity to step away from specific language features such as vocabulary or syntactical structures and examine the broader relationships between emerging bilinguals' teaching and learning in these classrooms and the

ways in which their language was used, or not, to negotiate meaning-making and mediate learning.

Academic language and literacy

Academic language is often used in textbooks, tests and in classroom discussions, and students are expected to understand it and use it in order to participate successfully in school. Schools, like any other social system, are communication systems (Halliday, 1978). Success in schools requires that students use language to have access to what is being taught and to communicate what they know. Some scholars recognize academic language as a Discourse of power (Baquedano-López, Arredondo & Solis, 2010, Delpit, 1993, Cazden, 2001) because of its prominent social role in schools. Through this lens, academic success for emerging bilinguals requires them to be competent in the Discourse of academic language so that they can demonstrate their membership in the school context (Cook-Gumperz, 1973; Ochs & Schieffelin, 1984).

While earlier theories viewed academic language as different from social language, (O'Malley, 1994; Cummins, 1980), more current research prefers to focus on the context in which language is used and not on whether language is social or academic (Bailey, 2007). Bailey (2007) argues that it is not the language, but the situation, that is social or academic. Emerging bilinguals come into schools already with complex and sophisticated knowledge about the use of language in various social contexts. However, schools present new contexts where language is just as complex and sophisticated as the language varieties that emergent bilinguals may use, but that may not be as familiar to them.

Another question of interest among linguists is whether language across all school settings is similar or different. Cognitive theory contends that cognition and discourse are discipline-specific (Lave & Wenger, 1991). Other research points to the similarities across disciplinary discourses (Bazerman, 2003, Bailey, 2007). Whether the discourse is unique to mathematics or similar to other content areas, emerging bilinguals must learn the norms associated with such discourse in order to participate meaningfully in school. Meaningful participation requires not only the opportunity to display knowledge, but also the opportunity to learn new information (Cazden, 2001). This can be challenging for many emerging bilinguals who are developing the language of instruction because language in classroom contexts has been recognized as de-contextualized (Cazden, 2001; Cummins, 1984; Menyuk, 1995; Snow, 1991). Mathematical thinking is critical in mathematics learning (Carpenter et al., 1989, Franke et al., 2009; Kazemi & Franke, 2004; van Es & Sherin, 2010) and the language associated with it is abstract, particularly in upper grades (Zwiers, 2008; Zwiers & Crawford, 2011). This style and form of communication, or register, involve more than just styles and forms; it involves developing the characteristic ways of talking within the culture of the mathematics classroom community. These culturally accepted registers, or genres, and the mathematical practices in classrooms involve written, verbal, and non-verbal forms of communication (Roth & Lawless, 2002). For all students developing this genre takes time (Bickmore-Brand, 1997; Ellerton & Clements, 1991; Hasan, 1996; Lemke, 1989), but especially for emerging bilinguals who are developing skills in a new language.

Approaches to teaching emerging bilinguals

While there are numerous approaches to teaching emerging bilinguals, in this section I will address only two of them-cognitivist and sociocultural approaches- because they are relevant to the discussions in this thesis.

Cognitivist approaches to teaching emerging bilinguals are based on the perspective that there is no distinction between learning and acquiring. Therefore, cognitive and developmental psychologists apply general theories of learning to language learning (Wright, 2010). In cognitive theories of learning, the learner is viewed as an information processor and the focus is on inner mental activities. In this paradigm, mental processes such as thinking, memory, knowing and problem solving are of interest.

While cognitivists are interested in interaction, they focus on the ways in which individuals process input and produce output. Theorists have postulated that second language acquisition is determined by the amount of comprehensible input, in other words, input that is understandable and that matches the language abilities of the emerging bilingual (Krashen, 1996; Swain & Suzuki, 2008). The importance of output was also studied from this perspective (Swain, 2000, Van Patten 2003) noting that input without the opportunity of experiencing production may not be processed. Other theories examined the importance of noticing specific features of language (Schmidt, 2001), the sequence in which language features are acquired (Lightbrown & Spada, 2006) and ways in which the learner incorporates new knowledge or restructures old knowledge (Van Patten, 2003).

Educators using cognitivism as a foundational approach to design their instruction focus on helping emerging bilinguals understand connections, break down information and rebuild it with logical connections. Being aware of those mental actions, monitoring them and controlling the learning processes is what is called metacognition (Metcalfe & Shimamura, 1994). Similarly, metalingualism is the act of being aware of one's use of language, monitoring it and controlling the processes used to learn that language (Beceren, 2010).

Sociocultural approaches to teaching, on the other hand, are premised on the belief that learning is a social activity and, therefore, knowledge is constructed through interaction and collaboration with others (Vygotsky, 1978). Language, from this perspective, is a tool for making meaning (Mitchell & Myles, 2004). Educators following sociocultural approaches believe learning happens within the Zone of Proximal Development of the individual, a metaphoric space where children can reach higher levels of knowledge and performance with support (Vygotsky, 1978). Within this approach, special attention is given to interaction and the context in which it occurs.

In the education of emerging bilinguals, sociocultural approaches promote the importance of acquiring knowledge and practices that afford emerging bilinguals meaningful participation in a language community (Langman, 2008; Ochs & Schieffelin, 1984). Participating in such communities requires not only possessing the language, but also learning the culture of the community. As emerging bilinguals acquire the language, they also socialize into a culture and a community (Wright, 2010).

Program models and instructional design

Emerging bilinguals in US schools are educated in a variety of types of programs. In some cases, they attend special classes focused on learning English, and in others they learn English as they are also learning the content of academic disciplines. While most of these programs limit the language of instruction to English, some programs are considered bilingual because they use students' home language as the language of instruction for part of the day. The language allocation in each program varies, as well as the profiles of the children who participate in the programs. This section will describe various model types with the caveat that local programs vary as they are appropriated by their communities and depending on resources and demographics.

Categorizing programs according to their purpose, we find transitional bilingual programs and developmental bilingual programs. Transitional programs have as an end goal to transition all instruction to English-only instruction. The time and way in which transition is conceptualized varies from program to program. For example, some programs may offer bilingual instruction for Kindergarten, first and second grade, while other programs may offer it through third grade. Other programs offer bilingual instruction through fifth grade, and will take newcomer students at any grade level through fifth grade. Some programs may begin with Spanish instruction for 50%, 80% or 90% of the school day or the allocation could be based only on certain academic areas. Transitional bilingual programs, sometimes called early exit programs, vary also in the way they allocate language use- they may allocate language by day, by week or by content area. Most programs considered transitional have policies about

language separation, which have the goal of creating separate spaces, times and sometimes even separate educators for each language.

Developmental bilingual programs have as a goal to develop the two languages that are part of the program. While they vary in the same ways as transitional programs (e.g., language allocation), they may also vary in the students enrolled in the program. In some programs, all of the students may be English speakers wishing to become bilingual in an additional language. These enrichment programs are also called one-way immersion programs. In other programs, all of the students may be learning English as an additional language. These programs may be also called one-way, maintenance or late-exit programs. The increasing number of bilingual programs are dual language or two-way immersion (TWI) programs. In these programs, the aim is to have 50% of the student population be speakers of one of the languages and the other 50% speakers of the other language. The goal in these programs is to develop bilingualism, encouraging oral fluency and literacy in both languages.

A critical look at such programs illuminates the fact that while the premise is to achieve social, academic and linguistic equity, such programs sometimes reproduce hegemonic views of and power dynamic between the two languages. While the program has the goal of all students becoming bilingual and biliterate, accountability measures and metrics used to measure the success of such programs in most of the research are standardized tests in and of English (Thomas & Collier, 2002). Further, typical designs of TWI programs allocate language of instruction in a way that ensures that all students interact in only one language at a time (Hornberger, 2005; Pérez, 2004; Reyes, 2001). Language is learned through content and there is explicit attention to cultural and linguistic practices. At first sight, these practices may appear

fair because everyone gets equal access to both languages. However, closer examination of these practices might suggest that the goals of bilingualism, biliteracy and academic achievement support emerging bilinguals from English-speaking homes more than they do emerging bilinguals from Spanish speaking homes, emerging bilinguals from homes where other languages are spoken, or students who are not from White, middle class homes (Palmer, 2010). Such is the practice of many TWI programs in which all interactions throughout the day occur in one language at a time, also called language separation.

For students who live in communities where the language used is the language of power, in this case English, the practice of language separation maximizes their exposure to the target language (e.g. Spanish). After all, school may be the only place where they interact using that language. However, for students who are acquiring English as an additional language, the practice of language separation restricts their use of language as a tool to mediate learning. On the other hand, for emerging bilinguals for whom English is not their home language, language separation restricts the use of their home language as a support in their development of English. While this is true for all emerging bilinguals in the program, English is the language in which high-stakes, large-scale, summative assessments are administered.

Another disadvantage of complete language separation, that is, making sure students interact in only one language at a time throughout the whole day, is that students are not able to engage in conversations related to metalinguistics, that is, in reflection on their use of and across languages. Strong metalinguistics skills have been associated with cognitive flexibility, mental abilities and divergent thinking (Bialystok, 1986; Díaz & Klinger, 1991; Landry, 1974;

Lambert, Tucker and d'Anglejan, 1973; Peal & Lambert, 1962; Yelland, Pollard and Mercuri, 1993).

Finally, language separation also promotes the illusion that bilinguals are two monolinguals in one (Grosjean, 1985) and the myth that they communicate always in one language or another, when the reality is that bilinguals move across languages in fluid ways (Grosjean, 1985; Gutierrez et. al., 1999; Lee et al., 2008). Given the increasing popularity of TWI programs and the lack of empirical evidence to support monolingual orientations to instruction that call for language separation in these programs (Cummins, 2005; Lee et al., 2008), I found the need to explore the use of language in these multilingual spaces. Translanguaging practices have been observed in social uses of language by emerging bilinguals, in formal and informal learning spaces, and during literacy instruction (DaSilva Iddings, 2005; Franquiz & Reyes, 1998; Martínez-Roldán & Sayer, 2006; Moje et al., 2004), but there is a need to observe its use as a mediating tool in other learning spaces.

While there are other types of programs, these are the programs that provide the necessary background to contextualize the data and the findings in this study. The classrooms observed were part of either developmental or two-way immersion programs.

Translanguaging

During social interactions, participants in classroom learning events, who include students and educators, use available repertoires -language, prior experience, knowledge and culture among other components- to mediate meaning-making of the information, concepts,

and ideas discussed within the learning space (Cazden, 2001; Freund, 1990; Shaffer, 1996; Vygotsky, 1978). In order for these social interactions to take place in educational spaces, students must have access to participation in the learning spaces. The use of multiple languages by multilingual individuals has been a focus of inquiry for many researchers. This linguistic practice- ways of utilizing and moving between more than one language in communication- has been variously labeled language hybridity, diglossia, code switching, code meshing, and translanguaging, just to name a few. Each of these terms has nuanced meanings and reflects different beliefs and values about the use of language. In this section, I will review the most relevant terms and concepts with the goal of describing the specific beliefs and values about language use by emerging bilinguals that framed this study.

When language contact occurs, languages may be changed in several ways. For example, it is common that one language may borrow a word from the other and incorporate it without translating it (Thomason, 2001). In some cases, a word may be borrowed while translating its components to create a new lexeme; this new lexeme, a calque, may or not retain the approximate sound of the original word (Gumperz, 1982). For example, the English phrase "blue blood" is a calque of the Spanish *sangre azul* and the Spanish word *rascacielos* is a calque of the English word "skyscraper." In other cases, a third simpler language is created for the speakers of both languages to communicate with each other, called a pidgin (Gumperz, 1982). Sometimes these pidgin languages disappear once the two languages are not in contact with each other; however, some pidgin languages become stable and become creole languages in subsequent generations (Gumperz, 1982). For example, when English first arrived in China in the 17th century, a form of Chinese Pidgin English developed to facilitate trade. However, as

English gained status and was preferred over its Pidgin form the Pidgin's use declined. When Haiti was colonized and invaded by a variety of countries over a couple of centuries, Haitian Creole developed, which is based on 18th century French with influences from Portuguese, Aramaic, Spanish, Taíno and West African languages. Today, Haitian Creole is the creole with the largest number of speakers. All these phenomena are different from code switching, in that they are codified into consistent patterns, whereas code switching typically occurs within individual utterances (Gumperz. 1982).

Early on, code switching was viewed as substandard language by some linguists (Weinreich, 1953), while socio-cultural researchers viewed the practice of mixing languages as a way for students to accomplish specific communicative and social purposes (Blom & Gumperz, 1972; Valdés, 1981). Garcia (2011) contends that the origins of bilingual education in the United States began with the view of different languages being used for different functions. Some theorists used Bakhtin's (1981) views of heteroglossia as a way to explicate the wide range of linguistic resources of emerging bilingual students (Gort, 2012; Martínez, 2010; Orellana & Reynolds, 2008; Worthy et al., 2013). Some of these researchers were interested in the ways in which emerging bilinguals moved flexibly across multiple aspects of their linguistic repertoires for thinking, communicating and constructing meaning (Worthy et al., 2013). Out of the Bakhtinian ideology also came the idea of "flexible bilingualism (Blackledge & Creese, 2010), which opposed the idea of parallel linguistic systems coexisting in bilingual individuals, but instead, their practices simultaneously used their different languages.

Another approach to understanding this linguistic phenomenon was language hybridity. In Location of Culture (2004), Bhabha uses postcolonial perspectives to explicate cultural and

linguistic hybridity. His view of a third space as a heterogeneous space where time and space crossed was not only ambiguous, but negotiated and contested at once. While Bhabha's view of hybrid spaces helped to conceptualize the existence of third spaces and explain the disorientation encountered in them as individuals reject structures and hegemonies in postcolonial contexts, the concept of hybridity remains at a level of abstraction that I find to be too distant from bilingual classrooms in American schools. Further, third spaces refer to the contexts in which language is used, whereas my goal was to examine the language use itself. However, the reason I have included third spaces in this literature review is because issues of power as they apply to diverse linguistic and cultural groups in contact are not only relevant, but also necessary when discussing Discourse in these spaces.

Another way to describe the practice of alternating between two or more languages is code switching. Research has focused on the use of code switching as emerging bilinguals' cognitive linguistic abilities or to describe classroom or learner emerging bilinguals' practices involving the use of more than one language (Romaine, 1989; Cenoz & Genesee, 2001). Others have investigated code switching as a strategy that emerging bilinguals use to negotiate meanings and identities (De Fina, 2007; Eastman, 1992). Still, much of this research described these language practices as illegitimate ways of communicating in the classroom, even when teachers used them (Heller & Martin-Jones, 2001; Lin & Martin, 2005). Code switching has also been studied with an interest in syntactic or morphosyntactic constraints on the movement across languages (Poplack, 1980; Sankoff & Poplack, 1981; Belazi et al., 1994). However, I decided not to use code switching because of the view of languages as codes, systems of syntactic rules in addition to the sense of the practices as an illegitimate way of communication.

Further, code switching is premised on a view of each language being a separate code, which learners switch between, as opposed to translanguaging, which views both languages as part of a single integrated repertoire.

Several researchers have recently focused on the use of flexible linguistic practices, named by some researchers as translanguaging, as resources that emerging bilinguals use in their learning (Canagarajah, 1995; Creese & Blackledge, 2010; García, 2009; Hornberger, 2003). Along with this research, new studies have emerged positing that translanguaging is normal for emerging bilinguals (Bhatia & Ritchie, 2004; Franceschini, 2010). The term translanguaging was coined by Williams (1994) to describe the controlled used of multiple languages simultaneously to communicate, thus maximizing the emerging bilingual's ability. However, in 2003, Baker used it to refer to pedagogical practices in which one language was used for input and another one for output (as cited in Hornberger & Link, 2012). Since then, scholars who study translanguaging have focused on defining the concept.

Studies in school contexts have shown the use of translanguaging as an informal and at times, "surreptitious" way of communicating among emerging bilinguals (Canagarajah, 2011, p. 401). Other literature has treated translanguaging in a more positive light as a linguistic resource of emerging bilinguals in learning (Creese & Blackledge, 2010; García, 2009; Hornberger, 2003). Canagarajah (2011) also proposed translanguaging as a tool to develop writing; although he suggests that "there is still more for multilingual students to learn in translanguaging," (p. 402).

Some scholars have examined translanguaging as pedagogy. Cummins (2005), for example, defined translanguaging as the use of bilingual strategies that teach explicitly for two-way cross-language transfer. Anderson (2008) defined it as flexible approaches to pedagogy to respond to bilingual contexts that do not fit the mainstream paradigm. Arthur & Martin (2006) called it the "pedagogic validity of codeswitching" (p. 197). Others have defined it as a practice of emerging bilinguals: García (2009) identified it as the usual and normal practice of bilingualism without diglossic functional separation; Hornberger (2012) defined translanguaging broadly as "how bilingual students communicate and make meaning by drawing on and intermingling linguistic features from different languages," (p. 240); Canagarajah defined it as the ability of multilingual speakers to "shuttle between languages, treating the diverse languages that form their repertoire as an integrated system" (2011, p. 401). In brief, literature treats translanguaging as both a practice and a pedagogical strategy.

Another point of diversity in opinion is the nature of translanguaging. Unlike other scholars, García (2009) included language varieties in addition to languages in translanguaging, broadening the usability of the term. As with other terms in academia, the definition of translanguaging gets refined, contested and re-negotiated with each new study.

In this study, I am using García's (2008) definition of translanguaging- as a practice used by emerging bilinguals use to move between languages- and treating the diverse languages that form emerging bilinguals' and their educators' repertoires as one integrated system (García, 2009; Hornberger & Link, 2012). However, I am also looking at its use in pedagogy because I am considering the teachers in this study as emerging bilinguals themselves. Using translanguaging as a lens affords me a comprehensive view of language use instead of a

fragmented view of emerging bilinguals' linguistic interactions. Viewing emerging bilinguals' linguistic repertoires through fragmented lenses (that is, examining language through an English or a Spanish lens) has illuminated a narrower range of resources than using an integrated lens and including students' and educators' use translanguaging practices (Gutierrez, Baquedano and Tejeda, 1999). Further, translanguaging provides an additive perspective to emerging bilinguals' rich linguistic repertoires and avoids the view of emerging bilinguals as two monolinguals in one body (Grosjean, 1985).

I am interested in looking at how these language practices play out in the ecology of the classroom during mathematical learning because, as socio-cultural views of mathematical learning suggest, in order for emerging bilinguals to be successful, we need to take into account resources, like translanguaging, that are not only appropriate, but are part of the resources that reflect the abilities and communication patterns of emerging bilinguals. Translanguaging, unlike hybridity, code switching, and other terms, also affords me the opportunity to study language movements as part of an integrated linguistic system.

CHAPTER 3: SETTING, RESEARCH DESIGN AND METHODOLOGY

Introduction

Current trends in American educational policy revolve around assessment and accountability of learning reading and mathematics (NCLB, 2001). For emerging bilinguals who are in the process of acquiring English as a vehicle to mediate learning, this means that they have to acquire the language that will be the vehicle for accessing content, like reading and mathematics, while at the same time not falling behind in learning the content of reading and mathematics. Research on learning other languages has shown that it fosters cognitive flexibility and has a significant correlation to academic achievement, cognitive development and positive attitudes and beliefs about language learning and other cultures (Cunningham & Graham, 2000; D'Angiulli, Sieger & Serra, 2001; Pagan, 2005; Thomas & Collier, 2002; Turnbull, Hart & Lapkin, 2003). Both the need to find effective means to supporting the academic achievement for emerging bilinguals and the correlation between learning languages, academic achievement and cognitive development for all children have caused increased interest in two-way bilingual programs.

My research seeks to explore how language is used in multilingual spaces, such as classrooms, in transitional bilingual education (TBE) and two-way immersion (TWI) programs, by emerging bilinguals and their educators. This chapter will provide an overall description of the study, a description and rationale for the epistemology in which the study is situated, and a

description and rationale for the methodology selected. I will also describe the tools and methods for data collection and for data analysis and discuss bias, validity, and reflexivity.

Research questions

The focus of this study was language use in bi/multi/lingual classrooms. The questions guiding my research were:

1. What factors shape language use in multilingual classrooms during mathematics instruction?
2. What forms of language are employed in multilingual classrooms during mathematics instruction? When? By whom? For what purposes?
3. Does translanguaging occur in multilingual classrooms? If so, how might we understand it? Can we identify any impact of translanguaging on learning?

Methodology

I situate this study within a constructivist epistemology (Luttrell, 2009) with the goal of studying the relationship between language and the individuals using it to make meaning of the world around them (Krippendorff, 1991; Von Glaserfeld, 1995). A sociocultural theoretical framework, which views learning as a process that takes place through social interaction (Vygotsky, 1989), fits well within constructivist theories of learning because of its emphasis on the relationship among individuals as a key element in how language use is shaped, and to what effect.

For methodology, I chose a comparative case study methodology because case studies allow us to investigate phenomena within their real-life context (Yin, 1994); in this study, the classrooms are the context and the unit of analysis is the linguistic interactions that took place within them during math instruction. Using case study as a methodology afforded me the ability to conduct an intensive analysis of all the variables at play in order to understand the use of language within the contexts of the classrooms (Yin, 1994). This deep understanding was achieved in part through a mixture of qualitative and quantitative analyses, which provided a more comprehensive view of the classroom ecology, the context of the school and district, and the characteristics, values and beliefs of the staff and families of the students, as well as the nature of the community where the study took place (Geertz, 1973).

In order to examine how language is shaped and used in a multilingual classroom, I spent an extended period of time observing the interactions among students, among educators, and between students and educators in five different classrooms in a TBE and a TWI program in one school site. I conducted case studies of three 4th grade classrooms and two 5th grade classrooms during mathematics instruction time, typically an hour daily, for the duration of one unit of study, which was three weeks long, at the beginning of the fourth quarter of the school year. While I will describe in this chapter all five classrooms, the data used in this thesis come from only three of the five classrooms, two 4th grade classrooms and one 5th grade classroom.

Qualitative analysis was conducted on data collected from observations in the classrooms, which provided an understanding of how language is used by emerging bilinguals and for what purposes. Qualitative analysis of the data collected during the observations also provided information on translanguaging practices and their impact on emerging bilinguals' participation

in classroom activities. Qualitative analysis was also conducted on data from interviews with the principal and director of the program, emerging bilinguals and their educators. These data provided a better understanding of the local and school community, the programs available and school policies. They contributed to addressing the question about the factors that shape language use in the classrooms observed. They also provided confirmation about the use of translanguaging in some of the classrooms, as well as information about the beliefs and views on translanguaging.

Quantitative analysis was conducted on data from staff and family surveys. This data related to language practices, language ideologies, cultural norms, and values and attitudes towards the use of language in and out of the classroom. This data also highlighted additional factors that shape language use as well as a better understanding of the sociocultural context of the school and the community.

In addition to interview and survey data, additional information was gathered through collection of student work samples, teacher-made handouts, and observations. This data offered opportunities to engage in deeper analysis of the language practices and analyze how language was used to demonstrate understanding of the material. Some of these samples also informed the analysis of use of translanguaging practices during instruction.

Data collection and instrumentation

Data collection took place during a full unit of instruction, over the first three weeks of the fourth quarter of the school year. I chose a unit of instruction to provide a bounded context of

math concepts and topics and to explore the teaching and learning of individual math concepts from beginning to end. I also chose to observe towards the end of the school year in order to be able to observe emerging bilinguals and their educators when they were already set in routines and the learning community had already had time to develop.

The data collection was conducted using the tools outlined below. A schedule including activities related to the study follows the list of tools for data collection.

1. **Observations, field Notes and memos**[4]: I conducted classroom observations of three 4th grade classrooms for one hour every day during the math instruction block for three weeks, which was the duration of one unit of study. Observing a full unit of study allowed me to examine how language was shaped around a new concept and how it evolved as the students became more familiar with the concept. During this time I looked for language used during student-student and teacher-student interactions. I looked for movement across English and Spanish and for contexts around language use. I also took notes on how the classroom was organized, the type of materials available, and the classroom activities and their design. Other things I noted were student and teacher roles, routines, special events, and interesting uses of language. A year later, during the same time of the year, I observed two classes of a subgroup of the same students with their 5th grade teachers for one hour every day for an additional week. The purpose of this

[4] Templates for field notes and memos used in this study are found in Appendix A.

additional period of observation was to collect additional data during a pedagogical strategy that teachers identified as the Bridge.

Data from these observations was captured in field notes, which served as written records of my observations during fieldwork (Hammersley & Atkinson, 2002; Jackson, 1990). Typically, field notes consist of descriptions of social interactions and the context in which they occur (Roper & Shapira, 2000) and they become the record of observations. One major disadvantage is that field notes are subject to the researcher's conscious or unconscious bias. In order to address this issue, I conducted member checks, mainly with educators, in order to ensure that my observations were accurate. I would typically conduct these during group work time or during teachers' planning time. At those times, I would approach the teachers to clarify something they said or to gain a better understanding of ideas they or the students shared during class. At these times, usually teachers provided additional contextualization or background to clarify some interactions. For example, I noted that one particular student in a classroom always helped to pass papers while other students only got selected some of the time. The teacher shared with me the next day during her planning time that this particular student suffered from anxiety and not participating in certain routines had consequences on her behavior sometimes for the rest of the day.

I also kept ongoing memos to record my thoughts, reactions and perceptions. Memos are records of the researcher's developing ideas about codes and their interconnections (Glaser, 1998, Montgomery & Bailey, 2007). Memos are a

documentation of the researcher's thinking processes rather than a description of a social context. By theorizing from the data, memos transform field-note descriptions into theoretical accounts. I completed memos after each observation during the first week, and then twice a week for the second and third week. My primary purposes for the memos were to capture reflections and possible routes for analysis. I also used my memos to share with educators and get additional member checks, since many times my field notes were not organized and comprehensible and I was not always able to check with them until the next day. I also used those times when I shared the memos to gather additional data in cases when I needed to better understand a situation, to confirm an assumption or to get additional background information. Often, even when I had had a chance to check in with teachers using my field notes, I found new questions arose as I transformed the field notes into memos or began my weekly analysis.

Data from observations, field notes and memos helped me to address all three questions in my study. I recorded some factors related to lesson design and to emerging bilinguals' backgrounds that shaped language use in multilingual classrooms. I also observed various forms in which emerging bilinguals used language, including translanguaging. I took note of when these forms were used, with whom and for what purposes.

2. **Audio-recordings:** Group work was audio-recorded and transcribed. The reason for recording group work was to capture emerging bilinguals' use of language and the conversations in which the language was used. Given the short amount of time I

was in the classrooms, I felt audio-recording would not be as intrusive as video-recording during small group interactions, so I opted for not capturing any video as data during this study. All teachers observed had specific times for emerging bilinguals in their classrooms to work in pairs or in groups. Given the number of groups, I observed groups and then selected two to four groups to audio-record daily, depending on the activity. I selected these groups so as to include a variety of students and include multiple interactions, but I also included students who I felt would be most comfortable working without being distracted by the voice recorder. Data from the audio-recordings mainly helped me to address the questions related to the ways in which emerging bilinguals use language and offered specific examples of translanguaging.

3. **Classroom artifacts**[5]: Most of the instruction was whole group or small group, and the primary written material was handouts, some teacher made and some photocopied or printed from online sites. I collected two set of handouts used during the Bridge period that I observed. Through the analysis of these artifacts, I captured ways in which students and educators used language for specific purposes in written form. Classroom artifacts also helped me to contextualize the audio recordings. Classroom artifacts included handouts, but they also included pictures I took of the classroom during my observations.

[5] Examples of the handouts are included in Appendix B.

4. **Formal interviews**[6]: I conducted (separate) formal semi-structured interviews with all five teachers, the school principal, and the bilingual district coordinator. I included: specific topics or themes related to their backgrounds; their values and beliefs about education (including language instruction and math instruction); their beliefs about language use by emerging bilinguals; and school and district language policies. I strived to be flexible to avoid constraining them to a particular format, and to allow topics important to them to emerge (Lindlof & Taylor, 2002). During the interviews, the conversations drifted to areas in which each of the interviewees were interested. The formal semi-structured interviews were recorded, transcribed, and then analyzed by coding the transcripts to identify emerging themes.
5. **Informal interviews**: In addition to formal interviews, I conducted ongoing informal interviews with emerging bilinguals and their educators to clarify their use of language during instruction, interactions or assignments, and its intended purposes and goals. The goal of these interviews was to gain a better understanding about the factors that shaped language and its use in multilingual classrooms. These interviews were impromptu and as needed and were not recorded. Instead, notes were taken about the various topics or clarifications made by the participants. One example of these types of interactions was a conversation with *la maestro Icela* when, on one occasion, she switched to speaking in English to one of the students during class or another time when a student who typically was not in the class joined for the day even though he was not in the bilingual program. Some of these

[6] Interview protocols for the teachers, principal and district coordinator are included in Appendix C

conversations took a few minutes and others took longer. During those conversations, she gave me more information about the linguistic background of those two students along with some of the reasons that related to the unusual circumstances and the change in language use.

6. **Surveys**[7]: I conducted a school staff survey and a parent survey. Each survey took about 15-20 minutes to complete and both were available in hard-copy format. The surveys for school staff included questions about language ideologies, values and beliefs, perspectives on math education, supports available to emerging bilinguals and general information about the school environment in which the classrooms are situated. These surveys were placed in staff mailboxes and additional copies were placed in the staff lounge. A box for completed surveys was placed in the main office. About 25% of staff responded to the survey. The data collected from the surveys were put in an Excel spreadsheet and analyzed for mean (average), range and mode.

   The survey for families was available as a hard copy in English and Spanish, since those were the only two languages spoken by the families of the students in the classrooms. The questions on the family surveys included questions about language ideologies, values and beliefs at home, perspectives on math education, students' and families' language varieties and practices outside school, and general perspectives about the school and community. Those types of questions yielded data that was coded qualitatively using codes identified from the interviews.

[7] Copies of the parent and staff surveys are included in Appendix D

However, the surveys also included questions about demographics and specific language use for various activities. Data from those questions were analyzed quantitatively in an Excel spreadsheet and informed my understanding of the community and socioeconomic status of the families in the school. Again, the mean, mode and range were calculated for the various responses.

The surveys were provided to the students and students returned them back completed to their teachers. About 50% of the surveys were returned, with one classroom returning 100% of the surveys. Only two of the surveys returned were in English; most parents requested them in Spanish.

Schedule

Table 1. Schedule of activities

Date	Activity
April 29- May 6, 2013	Subject consent obtained from 4th grade teachers and student families Staff and family surveys distributed
May 6- May 31, 2013	Data collection in 4th grade classrooms and ongoing analysis
May 7-8, 2013	Formal interviews with principal
May 8-May 10, 2013	Formal interviews with 4th grade teachers
May 31, 2013	Formal interview with district administrator
Summer and Fall 2013	Member check-in
Jan. 20, 2014	Additional consent obtained for 5th grade teachers

Date	Activity
Jan. 28-Jan 31 2014	Additional data collection in 5th grade classrooms and ongoing analysis
Jan. 30	Formal interview with 5th grade teachers

Reflected in the schedule above is one change that was made to the research protocol late in the study to collect additional data in two of the classrooms in the TWI program. The observations were done a year later than the original data collection, when the 4th grade students observed during the first year were then in 5th grade. The decision to collect additional data was made because the teachers interviewed during the first year mentioned the bridging activities as a critical component to their bilingual program; however, some had not been trained in them and others did not have them planned during the period of time of the original data collection. Therefore, an additional week of observations was scheduled during the same time of the year, the following year, with the same groups of students, but different teachers. The focus of the data collection this second time was exclusively for the purpose of understanding the practice of bridging and collecting student work that was the product of the bridging activities.

Data analysis

Analysis of collected data was ongoing. The data collected from observations were included in memos and the interviews were transcribed. This data was coded using a modified grounded approach (Glaser, 1965). While many of the codes emerged as the data were analyzed, there

were some a priori codes that included translanguaging, factors that influenced language use and purposes for language. However the first round of coding generated more specific codes as well as additional ones (Glaser & Strauss, 1967).

As I reviewed the codes, I combined, re-organized and categorized them in order to identify the main themes created from my initial analysis. Through this analytical approach, not only did I identify themes, but I also selected three of them as organizational concepts in this paper: translanguaging as a tool to develop mathematical thinking, which I then analyzed using both cognitive and socio-cultural perspectives; strategies *del Puente*, which I used to describe those linguistic strategies or methods used by emerging bilinguals to bridge concepts across languages, and cariño (caring) pedagogy, which I used to denote instructional approaches from particular teachers. Data from interviews and observations were re-analyzed using axial coding (Strauss & Corbin, 1990, 1998). In the data, I looked for factors that impact language use of emerging bilinguals, purposes for language use by emerging bilinguals in multilingual spaces, and the contexts in which translanguaging takes place. I also looked in the data for examples of the potential impact of translanguaging practices in learning and teaching.

Findings were recorded and shared with the teachers and one of the administrators in the study as a form of member check. I also shared the analysis with a peer researcher and the primary investigator of this study for discussion. The results of the study are presented in the ensuing chapters of this document.

In this next section, I will describe the setting in which this research took place, including information about the community, the district, the school and each of the classrooms I observed.

Setting

The community

This study took place in Hixton[8] Elementary School, located in the city of Newberry, just a few miles from the border between two states and about an hour and a half from one of the largest metropolitan areas in the Midwest area of the United States. Newberry is a small community of about 9,500 inhabitants; the greater Newberry community area is home to 21,500 inhabitants. Families in the community are served by the Newberry School District, which operates four schools within Newberry: Newberry High School, Newberry Junior High School, and two elementary-schools: Carsten, which houses the district's Kindergarten, first and second grade students and Hixton, which serves 4th and 5th grade students and their families. Driving down the highway, Newberry could go unnoticed as one more rural community in a series of towns that a state highway crosses, at least half an hour from the nearest interstate highway.

The town of Newberry was founded in 1856, but it was during the following few decades that it grew into a city thanks to the expansion of the railroad in the area. Historically, Newberry has had times of prosperity followed by long periods of unemployment, according to Ms. Dewey, principal of Hixton and long-time resident of Newberry. Several large

[8] All the names of the schools, districts and cities in this thesis are pseudonyms.

manufacturing companies have, at various times, employed large number of people in the community and attracted families from other areas of the state as well as migrant workers, but then left, leaving Newberry's city with different demographics and with willing and able working-age individuals unemployed. Most recently, in 1997, a large mobile telephone manufacturing and distribution facility on Newberry's north side opened and employed more than 5,000 people at its peak (http://www.nwherald.com/). However, a combination of factors, including a significant decline in their business in the early 2000s, compelled the company to shut the facility in 2003. Today, the 1.5 million square foot facility still stands on a hill at the entrance of the city, completely empty, with signs of no trespassing.

For its size and location, Newberry is a diverse city. The racial makeup of the city, according to the 2010 census, was 51.9% White, 45.2% Latino, 0.9% African American, 0.8% Native American, and about 1% from other races. The estimated median household income in 2012 was $37,333, almost $20,000 below the state's median household income. A large percentage of the population are blue collar workers, with jobs in the manufacturing and construction industries. In the downtown area, there are several Mexican businesses, including several restaurants, grocery stores and a butcher, all with names in Spanish. Still, when I asked a policeman about the Latino population before I had visited the downtown area, he did not name any of the businesses, but instead, gave me directions to a small local trailer park and described it as the place where all the Mexican families lived. Later on, as I got to know school staff and people who lived in the community, I realized that most Mexicans did not live in the trailer park, but throughout the city. The policeman's comment made me wonder about his perspective on the Latino population, first, calling all of them Mexican and secondly, assuming

most of them lived in the trailer park. I did not have the chance to interview or talk to other community members, but could not help but wonder whether this policeman's perception was representative of the community's perception of the Latino population or not. In reality, based on the demographic data from 2009 for the city, the median income for Whites, $47,508, was only slightly higher than that of Latinos, $40,439. The highest median income in 2009 was received by Asians, who represented only 2% of the population, but whose income averaged almost $200,000. It is important to mention that although there is farming in the area as well as several small businesses operating in Newberry, a large part of the community of Newberry travels daily to nearby towns and cities to work in mostly blue collar jobs.

The first place I visited in Newberry was its local library. The library was established in 1908 with funds donated by a former resident (http://www.harvard-diggins.org/drtest/index.php). At that time, Newberry became the first town in the county to have a library building. In 2001, the library moved to new facilities and the name was changed to the original sponsor's name. The new library is large and has a great collection of books and online materials. It also has a growing section of books and reading material in Spanish, and the librarian works closely with school district staff to continue to build the collection. On the poster board at the entrance, there are announcements mostly in English, but the literature about community services available on a table by the board is available in both English and Spanish.

Walking through Newberry during the week, it is not immediately apparent that almost half of the population is of Latino origin, until you get to the end of the main street where Mexican restaurants and businesses are located. There is significant physical segregation

between the White and the Latino on regards to where they live and where they do business. Another place where this diversity becomes apparent is as you enter the Newberry schools, where 60% of the district's population is of Hispanic origin, according to the School District's 2013 report card.

The district

Newberry School District served 2,413 students during 2012-13, the school year when this study took place. Table 2 displays demographics for the district and the state reported in the 2013 State and District Report Card:

Table 2. Newberry District and State demographics in 2013

		District	**State**
Population		2, 413	
Race (%)	White	37.5	50.6
	Black	0.8	17.6
	Hispanic	59.8	24.1
Low income (%)		63.2	49.9
English Language Learners (%)		27.9	9.5
Students with IEP (%)		10.4	13.6
Drop Out (%)		3.2	2.4
Mobility (%)		15.3	12.8
Attendance (%)		94.9	94.2

From the data, it is important to highlight the high percent of low income families in the community. From survey data collected for this study, 98% of parents self-reported an average salary range of $0-$25,000. It is also worth mentioning the high rate of school attendance. According to Ms. Palmetto[9], director of the district's ESL and bilingual programs, high school

[9] All the names of educators and students in this thesis are pseudonyms. In the case of educators, I gave them the option of creating their own pseudonym. The pseudonyms reflect the title they used or if they used their first or last name. For example, Ms. Palmetto went by Doctor and her last name, Ms. Lucy used Miss as their title and her

attendance is the result of the strong relationship the district has developed with the families through years of ongoing communication. "Parents who are well informed are supportive," Ms. Palmetto affirmed when I interviewed her at the district office (interview, 5/7/2013). For this reason, she started dual language family nights several years ago when the program was composed of only 50 students and 2 classrooms. Today, the dual language program is in each school in the district and almost 75% of the total district ELL population, according to Ms. Palmetto, are in the program. Her vision is that every child who enters the district is offered the choice to be bilingual, so 100% of kindergarteners entering the district are offered the choice of enrolling in a dual language immersion (DLI) program, regardless of their home language. The support of the district's superintendent has been key, according to Ms. Palmetto, in making this possible. While the superintendent is supportive of the program, she does not have background in bilingual education or second language acquisition, so it has been Ms. Palmetto who has provided the vision and designed the program as it operates in its current state.

At the time of the study, Newberry had transitional and dual language immersion[10] (DLI) programs. The district also offered ESL support to emergent bilinguals who were learning English as an additional language, but whose parents declined bilingual services. Before the DLI program was established in Newberry in 2007, following the state's regulations, English

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first name, la maestra Icela used la maestra and her first name. In the case of Mr. C, he used his full last name, but he chose to only use an initial as his pseudonym.

[10] In Newberry District, they used the term Dual Language Immersion (DLI) to denote two-way immersion programs, in which instruction was provided in both Spanish and English. The goal for the program, just like in a two-way immersion program, is bilingualism and biliteracy- reading and writing in two languages. Half of the population are emerging bilinguals learning Spanish as an additional language and half are emerging bilinguals learning English as an additional language.

Language Learners (ELLs) were served through a Transition Bilingual Education (TBE) program. When the DLI program was first available, only some of the students joined the program while the rest enrolled in TBE programs working in parallel to the DLI program. Each year, as the DLI program has grown, the TBE has slowly disappeared.

La maestra Icela's and Mr. C's classrooms were two of the classes that were not part of the DLI program. These students had been served through a TBE program since kindergarten because at the time of their enrollment in Kindergarten there was either no room in the DLI program or the parents chose not to enroll them. At the time of the study, according to Ms. Palmetto, all incoming kindergarteners had the choice to enter the DLI program if their families chose to do so. In the DLI program, students receive instruction in Spanish 50% of the time and in English 50% of the time in the model Hixton Elementary uses. In DLI classrooms at Hixton, students have a different teacher for each language, while in transitional bilingual classrooms the same teacher teaches both languages. The dual language immersion program is available from Kindergarten through eighth grade and follows a 50/50 model of instruction, in which half of the instruction is taught in English and half of the instruction is taught in Spanish.

Table 3. Newberry's language and content allocation plan for their DLI program

Dual Language Program Design - 50/50 Model
Content Area and Language
Spanish and English

Grade	Spanish	Bridge	English
K	Language Arts Science Social Studies	Strong Emphasis on Oral Language Development	Language Arts Math
1	Language Arts Science Social Studies	Explicit planning for content and language transfer ↓	Language Arts Math
2	Language Arts Science Social Studies		Language Arts Math
3	Language Arts Science Social Studies		Language Arts Math
4	Language Arts Science Social Studies		Language Arts Math
5	Language Arts Math		Language Arts Science Social Studies
6	Language Arts Social Studies		Language Arts Science Math

Table 3, included in the district's Dual Language newsletter, shows the language and content allocation plan for kindergarten through 6th grade in Newberry. Ms. Palmetto defines the goal of the dual language immersion education program as that of supporting students to develop high levels of bilingual proficiency and biliteracy- being able to read and write at or above grade level in two languages.

The state where Newberry district is located requires, as part of its school code, that when an attendance center has an enrollment of 20 or more English learners of the same language, the school district must establish a transitional bilingual education (TBE) program for them.

Newberry District, under the leadership of Ms. Palmetto, established the DLI program in 2007, meeting the state's law and going beyond to provide bilingual educational opportunities to all children in the district. Since the DLI program's establishment, Ms. Palmetto has spent countless hours leading the organization of the program and its instructional design, obtaining and providing professional development for the educators in the program, and meeting and co-developing advocacy skills with the families of the students in the program.

Ms. Palmetto created a leadership team with teachers and administrators from the two elementary schools in the district to create the design for Newberry's DLI program. They worked with assistance from the state's Professional Development Center to look at data from their demographics and their content and language assessments and craft their DLI program for ELLs while establishing a process for addressing curricular and instructional implications such as language allocation, teachers' roles and responsibilities, resources, etc. The team received ongoing technical assistance from the state's Professional Development Center and also enrolled in many other professional development activities. In addition to acting as the district's program administrator, Ms. Palmetto also acted as an instructional leader, as a resource, and as a coach for the teachers. As an instructional leader, she provided teachers with schedules that allowed them to collaborate as well as time throughout the year to attend professional development. As a resource, all of the teachers interviewed for the study named her as the main resource in the district to whom they turned when they had questions about the implementation of the model or when they needed instructional materials. Ms. Dewey, Hixton's principal, also described Ms. Palmetto as the person to answer any questions the bilingual teachers have about instruction. Finally, as a coach, Ms. Palmetto visited the

classrooms often, dialoguing with teachers on an ongoing basis, and modeling strategies when necessary.

From longitudinal data, 2005 and 2008 were the two years that Newberry had its lowest performance on state achievement assessments in the last ten years. Since 2008, when the percent of students scoring 'meets' or 'exceeds' on state assessments was 66%, this percentage has consistently increased, up to 71% in 2012. In 2013, the year when this study took place, the percent went down to 38%, due, in part, to the fact that the state raised its performance cut scores in reading and mathematics to align with college and career ready expectations (state report card, 2013).

The school

At Hixton, 400 students attend 4th and 5th grade. Students in Kindergarten through 3rd grade attend Carsten Elementary School, a few blocks from Hixton. The middle school and high school are located on the same campus as Hixton, but each in a different building. In between the schools, there is a large parking lot, the district's sports fields and smaller play areas.

Table 4. Hixton School and Newberry District's demographics

		Hixton Elementary	Newberry District
Population		592	
Race (%)	White	39.3	37.5
	Black	0.8	0.8
	Hispanic	58.0	59.8
Low income (%)		67.3	63.2
English Language Learners (%)		23.5	27.9
Students with IEP (%)		8.5	10.4
Drop Out (%)			3.2
Mobility (%)		9.1	15.3
Attendance (%)		95.6	94.9

Table 4 shows that Hixton has similar demographics to the rest of the district. This table summarizes Hixton's school demographics, available through the state's school report card and compared to those of the district.

My observations took place in five different classrooms at Hixton Elementary School, three 4th grade classrooms and two 5th grade classrooms during mathematics instruction for the period of one unit of study, which lasted about three weeks. The 4th grade teachers' names were la maestra Icela, Mr. C and Mr. Valadez, and the 5th grade teachers' names were Ms. Lucy and Ms. Martínez. In the following section, I describe each teacher and their classroom to provide background information about the various contexts in which the study took place.

La maestra Icela[11]

La maestra Icela was born in Texas and moved to the area with her family about 6 to 7 years before the time of the study. Previously, she had taught in Texas where she lived for many years. While she and her family –her husband and two daughters- lived in a nearby community to Hixton Elementary, she knew many of the families of her students and communicated with them regularly. She taught both in English and Spanish to a group of twenty-six 4th graders: fourteen boys and twelve girls. Her students were all emerging bilinguals, and most were fluent in both English and Spanish, except for three students, who felt most comfortable in English, since their families did not use Spanish at home. All of the families

[11] The format of the pseudonym represents how students and other staff referred to this teacher, by her first name preceded by *la maestra.* When talking directly to her, she was called by her first name preceded by *maestra.*The pseudonym Icela was chosen by the teacher.

of the students in her class self-identified as Hispanic or Mexican, according to surveys collected from her class during the month of May, 2013. However, as la maestra Icela explained during an interview, her class's language proficiency in Spanish is very varied: some feel most comfortable in Spanish, some feel comfortable in both Spanish and English, and some do not understand most Spanish (interview, 5/8/2013).

In her classroom, la maestra Icela taught in Spanish in the morning and in English in the afternoon. While other transitional classrooms in the school taught different subjects in English than in Spanish, la maestra Icela taught language arts and mathematics in both languages and incorporated science and social studies into her language arts block of time.

There were 24 students in her class, including 13 girls and 11 boys, who sat at individual desks, arranged in groups of 4 to facilitate group work. All students were emerging bilinguals who identified Spanish as their first language, although their proficiency levels varied greatly, from being able to understand, but unable to express themselves in Spanish to emerging bilinguals who were able to elaborate on various topics orally and in writing in Spanish. Their comfort with English also varied among all students in the class.

Mr. C

Mr. C arrived from Mexico City when he was 29 years old with a bachelor's degree in business administration. At the time of the study, he lived about 35 minutes from the school, in a nearby town. When he began to study English, his own ESL teacher offered him the opportunity to begin to teach GED classes to adults in Spanish. When he was given the opportunity to get a bilingual teaching license through a state-sponsored program, he

immediately accepted, because of the positive experience he had had while teaching adults. Mr. C taught in English and Spanish to a class of twenty-four 4th grade students -twelve boys and twelve girls- in the TBE program, all of who, except for three, were born in the US.

Mr. C taught in Spanish in the mornings and in English in the afternoons. He taught language arts in both languages and mathematics in Spanish, while Social Studies and Science were taught in English.

There were 25 students in Mr. C's class, including 12 girls and 13 boys. Students sat at rectangular tables in groups that varied from three to five students per table. All students in Mr. C's class were emerging bilinguals from Hispanic origin, and all but one student in his class identified Spanish as their home language. That student identified English as her home language.

Mr. Valadez

Mr. Valadez was the youngest of all the teachers I observed, in his early to mid-twenties. He was in his first year of teaching and was, at the time, taking classes to pursue his bilingual license, since his license was only for general education. When Ms. Dewey interviewed him for the position, he was not aware that he could have gotten an additional license as a bilingual teacher given that he was bilingual.

Mr. Valadez taught a 4th grade class of twenty-seven students, 13 boys and 14 girls, all of Hispanic or Mexican descent, according to students' records, and all of whom felt most comfortable in English. He taught exclusively in English because this group had been part of the TBE program and had already begun their transition into English when the district decided that

they would transform their TBE program into a 50-50 late-exit or maintenance model, that is, one that provided bilingual instruction through fifth grade. This was the only class at Hixton that was composed of emerging bilinguals that was taught exclusively in English. The 27 students in this class sat at 5 rectangular tables with 4 to 5 students per table.

During my observation in this class, I was not able to capture Spanish being used in the classroom.

Ms. Lucy and Ms. Martínez

The 4th grade classrooms described above were the main focus of my observation. However, each of the teachers in the 4th grade classrooms mentioned a component of the bilingual program called *the Bridge* and identified it as a key component of the bilingual programs at Hixton. While all three teachers talked about it, I did not observe the bridging component in any of the three classes. A year later, in the spring of 2014, I came back to Hixton Elementary to observe Two-way immersion (TWI) classrooms co-taught by two teachers: Ms. Lucy, a veteran teacher of about 10 years, and Ms. Martínez, who was in her third year of teaching. Ms. Lucy taught the English part of the day of the two classrooms and Ms. Martínez taught the Spanish part of the day of the two classrooms.

There were 26 students in one of the fifth grade classroom, with exactly 13 girls and 13 boys. I chose 5th grade in this cycle because I would be observing the same children engaged in the learning activities as I had seen the year before. The other 5th grade class had 25 students and there were 12 girls and 13 boys. One group had instruction in English in the morning in Ms. Lucy's classroom, where they sat at small tables that could be moved around to achieve various

arrangements. The other group had instruction in Spanish in the morning in Ms. Martínez classroom, where they sat in individual desks that were also moved to do group work, although there were additional larger rectangular tables in the room where students could work together. After lunch, the two groups switched rooms to receive instruction in the other language.

While the teachers used one of the languages of instruction-Spanish or English-assigned to them throughout each unit, at the end of it, the other teacher would make time to do what they called *the Bridge*. This was an activity that related to the same content, but in the language that had not been used during the original unit. The idea behind this model is that students would transfer what they knew in one language to the other during the Bridge.

My goal in each of these classrooms was to observe how language was used in mathematics instruction in these multilingual spaces. While all of these classrooms were part of the same district and the same school, the program models each of them used, the individual teacher's approaches, and the students' language experiences were varied and provided rich opportunities to observe language in very different contexts.

Bias, validity and reflexivity

My family, my language, and my ethnicity are at the core of who I am, as an individual, as a professional, and as a scholar. I was born and raised in Veracruz, Mexico, in a middle class family that placed education and, particularly, language education high in their priorities. Although both my parents had careers in the sciences- Chemistry and Engineering respectively,

they held language development in high esteem. By the time I was fifteen years old, I was fluent in Spanish, English, and French. I was able to converse in all three different languages without mixing their syntactic structures or vocabulary.

Not only was I sequential in my language learning, but also "monolingual" in each of the different languages I spoke. In other words, I did not mix them; I used English during English class Monday through Friday evenings, French Monday, Wednesday and Friday afternoons and Spanish at home and in regular school. During English class, we were not only told to speak English only, but there were fines if we spoke in a different language. At home, my parents valued "pure" language and would admonish us for speaking "improper" Spanish. It was not that my parents did not like the fact that we had other languages to communicate in- they had encouraged us to acquire them and even asked us to recite poems or speak in those other languages during family reunions- but they believed that to mix languages meant that we were confused or that we did not have enough proficiency in each of those languages. Through these behaviors and influences, the beliefs I acquired about language use made me value the separateness of the languages I had learned. I believed I spoke languages better than those who mixed them: *pochos*, as my mother would call them.

When I turned 20 years old, I came to the United States and realized that language was not used in the same way that my books indicated or that my parents and teachers had established, and that expressing feelings, concepts and ways of seeing the world could not be captured by any one individual language I knew. I recognized that my identity was not fixed, but instead that it was continuously developing, shifting, and growing in unexpected ways through my life experiences. I was on the journey of multilingualism and along the way I

leveraged my various identities and languages in learning and towards group membership. At times, these identities were contradictory and I felt stuck in between them. Translanguaging practices were the best way for me to express these contradictions. I used my different experiences and identities to find a place in a world that was so foreign to me.

As I worked in schools with bilingual children over the following 14 years, I realized that my experience was not unique and started to realize how children inhabited multiple identities and languages, and benefited from using them all as repertoires for learning in more varied ways than those proscribed or even recognized by schools.

As I embark on a study to examine the shaping and use of language, I bring the same identities and practices that I have experienced and developed over the course of my life: I bring the monolinguals within me who guard the purity of language; I bring the Chicana in me who pushes the limits of my own hegemonic language ideology; and I bring the students with whom I have worked with for almost half my life. What is interesting about these identities and experiences is that they share the same space while embracing marked differentials of privileges and power.

Awareness and consciousness about these diverse and even opposing perspectives were critical during the analysis of data in this study. Checking my analyses with other researchers, doing member check-ins whenever possible and self-monitoring in an ongoing manner for bias was crucial in limiting the amount of bias in the course of the study, as well as in the discussion of my findings. While it may be impossible to avoid all bias, it is important to recognize it and analyze its impact on the data analysis and findings. Validity was enhanced by the use of

multiple sources of evidence (e.g., observations, surveys and interviews), ongoing checks of data analysis (e.g., with colleagues), and participant check-ins (e.g., sharing and discussing findings with two of the teachers in the study).

Positionality was another factor to consider during the collection and analysis of the data. As a former teacher, I was able to connect with the teachers in this study and they often would say things like, "I don't know if this happened to you, but…" In my experience, when teachers make this type of comment and you respond with specific examples of your own teaching, a sense of camaraderie and trust develop.

I also realized that my Latina background helped me establish almost an immediate connection with 4 of the 5 teachers, who were Latinos. Those 4 teachers felt comfortable switching languages during the interviews and two of them engaged in informal conversations with me about the families of the students and their own experiences as Latinos in the area. Ms. Lucy was not of Latino descent, so instead of talking to me as a peer, she hesitated and often defended her statements, but most often she deferred to Ms. Martínez to answer any questions about the program or the pedagogy behind their choices.

My work at the university and as an occasional presenter at local, state and national conferences, but mainly my position within a consortium of states that supports standards implementation and assessment of language, was the part of my identity that concerned me the most coming into this study. I was afraid that my presence in the classroom would produce discomfort or heightened awareness of their teaching and language practices on the part of the teachers. In order to minimize issues related to positionality, I recruited, contacted and

conversed with all the TWI educators in the school before making the final selection of the classrooms I would observe. However, during that initial conversation, all of the teachers were very open and comfortable with my role as a participant observer in their classroom. They were helpful, welcoming and went out of their way to discuss openly questions they had, challenges and even resources they felt they needed to further their work with emerging bilinguals. They were very honest about their lack of knowledge in particular areas as well as their ideologies and feelings about teaching mathematical thinking. The prolonged and daily visits to the classrooms also provided an opportunity for educators and students to become familiar with me. Finally, two of the teachers took advantage of my offer to discuss with me findings of my research, and this strengthened their trust that I would represent data in a way that respected them and valued them professionally and personally.

Regarding my positionality from the perspective of students, all students were interested in my presence during the first few days that I came into their classrooms. They were also interested in the voice recorders and how they worked as well as in the notes I took. However, after a few days and my continuous explanations to them about what I was doing, this interest shifted to familiarity. Some students saw me as another educator in their classroom and felt comfortable asking me questions about their work when the teacher was helping others or in one case, when the teacher was out and a substitute teacher was teaching the class.

Summary

The aim of this study was to explore how language is shaped in multilingual classrooms and how it is used during mathematics instruction. Multilingual classrooms are spaces in which

students and educators possess various linguistic and cultural resources. As part of this study, I observed how different languages and language varieties in multilingual classrooms were used by students and their educators as tools to mediate the teaching and learning of mathematics. The goal of my study was to add to the existing research on how educators can manage and organize content instruction, including the use of translanguaging practices, to enhance opportunities for academic achievement for emerging bilingual students. The study includes case studies of two classrooms in a TWI program and three in a TBE classroom, which were transitioning into a developmental model. Data collection included oral and written samples of language used during math instruction, formal and informal interviews with students and educators, document collection, and surveys and interviews of families and school and district staff. Data were analyzed through a mixed methods lens. Data from surveys was analyzed quantitatively and used to complement the qualitative information and enhance my understanding of the families and school community. Data from interviews and observations was analyzed through cognitivist and sociocultural lenses to identify how language is shaped in these multilingual spaces, factors that impact how language is used, ways in which language is used during content instruction, and how these intersect with learning.

CHAPTER 4: TRANSLANGUAGING AND MATHEMATICS: COGNITIVE AND SOCIAL PERSPECTIVES

"Diez, twen…one second, twenty-one, dos, veintidós, quedan uno, uno, dos, dieciséis…"

Introduction

The words above were mumbled by Angel, a ten year old boy in Mr. C's class. Angel was working with Pedro, another ten year old boy in the same class, on trying to balance someone's checkbook. Mr. C had given them information about this person's purchases, payments and deposits and the boys were working on balancing his or her checkbook. The information was fictitious, but Mr. C wanted them to apply some of the mathematical thinking they had been working on during math class. Angel was doing math in his head and mumbling his calculations out loud; some numbers were coming out in Spanish while others were in English. This is a common occurrence at Hixton Elementary, where 75% of the students are either in a transitional bilingual program or a two-way immersion program, but all are emerging bilinguals[12] receiving instruction in both Spanish and English.

In this chapter, I will explore the use of language by emerging bilinguals from two complementary perspectives on second language acquisition: the cognitive and the socio-cultural. Social interaction is key in the construction of knowledge, understanding and learning in both perspectives (Mercer, 1996; Resnick, 1987, 1991; Wells, 2007). However, the interplay of both perspectives provides a broader portrait of the use of language by emerging bilinguals

[12] I chose the term emerging bilinguals to represent all students who are learning in two languages, including students who speak Spanish as their home language, those who speak English or another language as their home language and those who speak both as their home language. Therefore, when I use emerging bilinguals I include all these groups. If I refer to a specific subgroup, I will qualify their linguistic background. I also consider bilingual teachers as emerging bilinguals to illustrate my belief that language learning is a journey.

like Angel and an opportunity to theorize on mental processes that may take place during learning and negotiated construction of knowledge. I would like to use these two perspectives to create a conceptual argument for translanguaging as a practice of moving across languages as part of a single communication system. In order to support this conceptual argument, I will use a few selected pieces of data collected from Mr. C's classroom that are representative of my claim.

Mathematical thinking, working memory and translanguaging

By fourth grade, students are expected to be able to add, subtract and multiply (CCSS, 2010). However, they are still engaged in developing their mathematical thinking. There are several factors that are critical in developing mathematical thinking, including early mathematical knowledge (De Smedt, Verschaffel & Ghesquiere, 2009; Jordan et al., 2007; Purpura et al., 2013). Mathematical skills are believed to develop as a progression of interrelated facts and concepts (Baroody, 2003; Gersten & Chard, 1999; National Mathematics Advisory Panel [NMAP], 2008), therefore, one must acquire basic knowledge before developing more complex mathematical concepts. However, in addition to basic mathematics performance, there are other non-mathematical factors that have been suggested to impact mathematical development, such as working memory (Alloway & Passonunghi, 2011; Holmes & Adams, 2006; Raghubar et al., 2010) and language (Fuchs et al., 2005, 2008, 2010; Purpura et al., 2011).

During the period of observation, Mr. C's class worked on a unit related to algebraic thinking (CCSS 4.OA). He provided each group of students with a narrative of financial activities

for Mr. X, a fictitious person. The narrative detailed various activities and transactions throughout the month. Transactions varied from buying groceries, to getting paid, to going to the movies, along with the dates when the various activities took place. In solving the problem of balancing the checking account that Mr. C provided them, students worked in pairs or triads, trying to decide when to add or subtract, or even multiply if similar quantities were provided. Angel, Pedro and Juan were three boys in Mr. C's class at the time of this study who worked together in a group. Juan, however, spent most of the time singing a song in Spanish and talking to some girls in the next table while Pedro and Angel worked together on the mathematics problems.

Mr. C asked the students in his class to talk through the problems with their group and to decide on how to approach each problem together. The text was written in Spanish, but Mr. C used both Spanish and English when giving the directions and when modeling an entry in the imaginary checkbook[13]. Here is an excerpt from the worksheet Mr. C assigned to his class:

> *El 10 de octubre, el hermano del Sr. X le pagó $150 de un préstamo que le había hecho y el Sr. X fue de compras y gastó $238*
>
> On October 10, Mr. X's brother paid him back $150 that he had borrowed and Mr. X went shopping and spent $238

It can be argued that Angel and Pedro used their working memory while solving the checkbook problems because they had to engage in multiple cognitive tasks simultaneously (Baddeley, 1992; Engle et al., 1999; Just & Carpenter, 1992), including analyzing the text,

[13] Translations provided in this thesis are literal with respect to overall meaning, but not a direct translation word by word in order to preserve meaning. Spanish text has been italicized.

evaluating strategies to solve the problem, extracting the relevant information from the text, retrieving arithmetic facts, evaluating their answers, and connecting new knowledge with previously learned information. From the linguistic end, they had to process the language from a semantic lens, to understand the meaning of the words from syntactic and pragmatic lenses, and to understand the organization and conventions used in the text. Finally, moving across various language registers, including social and mathematics Discourses, also required additional mental engagement.

From a cognitivist perspective, the mental processes used in language acquisition can be broken into macro-processes or micro-processes. Micro-processes that underlie language use include attention and working memory, integration and restructuring, and monitoring (Ellis, 2008; Gass & Selinker, 2008). Of special interest in the interaction above are the micro-processes of integration and restructuring, because it is through these processes that language learners change their interlanguage systems (Ellis, 2008). The term interlanguage has been used to describe the dynamic linguistic systems of learners of a second language who have not yet become fully proficient in it, but approximate the target language while preserving features of their first language (Ellis, 2008; Selinker, 1972). Because we are assuming that emerging bilinguals are developing two language, the premise that mental processes that underlie other types of learning and second language acquisition also apply to emerging bilinguals, which would afford the opportunity to examine translanguaging in the same way interlanguage is viewed: as a mental micro-process. Viewing translanguaging as a micro-process suggests translanguaging could be an automated process for emerging bilinguals, like Angel, engaged in

the process of learning a new skill. Automatic processing is a skill that individuals can perform rapidly and with little effort, which typically is a result of practice and training (Hummel, 2014).

The way in which Angel and Pedro use language when doing mental addition- moving between languages- is an example of translanguaging.

Angel: *Diez…me queda uno nada más…tenemos que sumar*

Ten…I have only one left…we have to add

Pedro: *Diez, twen…one second, twenty-one, dos, veintidós, quedan uno, uno, dos, dieciséis…se lo está gastando*

Ten, twen...one second, twenty-one, two, twenty-two, there is one left, one, two, sixteen…he's spending it all

Angel: Wha…? (sic)

Pedro: This one *se'ta gastando este dinero, ¿verdad?*

This one is spending the money, right?

I believe that while translanguaging is not something emerging bilinguals train for, it is a skill they engage in throughout their lives and often hear in their communities when growing up in the United States. By the time they come into schools, I believe emerging bilinguals use translanguaging to support controlled processing. Controlled processing is the mental process in which learners engage as they learn new skills (Hummel. 2014). This type of processing is slow and is limited by short-term memory. For emerging bilinguals, I am suggesting that translanguaging is one way in which they can expand or support their working memory, just like Angel did while performing calculations so that he could be able to engage in other simultaneous mental processes related to the calculation. It is important to note that the

previous argument about translanguaging practices is based on the premise that the mental processes used for general problem solving in math and other cognitive activities are also used in processing language. This is a perspective in second language acquisition also known as an information processing approach, or cognitivism (Ellis, 2008; Hummel, 2014; Van Patten & Benati, 2010).

One of the issues on which research on translanguaging has focused recently has been whether or not translanguaging is a single linguistic system (Canagarajah, 2012; García, 2014). Using cognitivism as a lens, I am proposing that the interaction above supports the hypothesis of emerging bilinguals using all of their linguistic resources as a single comprehensive language system because this student, Pedro, was able to fully recruit memory and knowledge from his integrated language system to make sense of and complete the task.

Language skills have been found to impact mathematical performance (Hooper et al., 2010; Purpura et al., 2011; Romano et al., 2010). In elementary school, language was found to have a significant impact on students' ability to solve story problems (Fuchs et al., 2005, 2008, 2010). For children like Angel and Pedro, their work consists not only of making meaning of mathematical concepts, but also of connecting their quantitative knowledge to, and representing it through, words and symbols. Moreover, they need to understand how language is used in mathematics in similar and/or different ways than in social situations. I use *language use in mathematics* intentionally instead of *the language of mathematics* to highlight that it is not really two separate systems of language that students navigate – the social and the academic-, but two different ways of using language that are directly related to the context, which changes when going from a social situation to a math classroom. In academic contexts,

such as mathematics classrooms, it is not enough to know the meaning of words like *plus*, *and*, *add* or *together,* but also to understand how the way in which these words are used can make them mean similar or different things.

Angel: *¿Qué es préstamo?*

What's *préstamo*?

Pedro (mumbling while continuing to add with his fingers): *Es como* "lend," you know? Como "lend me a pencil…"

It's like lend, you know? Like lend me a pencil…

Angel: So*, ¿le prestó 150?*

So, he lent 150?

Pedro: *No, menso, ¿no ves? Le pagó, como la* cash store, *te prestan y les pagas*

No, dummy, don't you see? He paid him back, like the cash store, they lend you and you pay them back

In the excerpt above, knowing that *préstamo* means loan is not enough. It is important to understand the whole context and meaning of the phrase, *le pagó $150 de un préstamo que le había hecho*, which means that he was paid $150 from a loan he had given, not taken. Knowing the difference between taking a loan from someone versus giving a loan to someone else provided the needed information for Angel and Pedro to know if they needed to add or subtract 150. Words and phrases are embedded in particular Discourses with particular norms that students learn through apprenticeship in math learning communities as well as various language communities outside the learning environments. Pedro's knowledge about how loans worked in the community was to his advantage, but, of course, his experience was not necessarily the only factor in accessing the information; being able to look at the whole

sentence and not looking for specific words within it was also important. While the fact that context has an impact on language could be an outcome from a socio-cultural analysis, I am including it here to make the case that the analysis of context involves additional mental processes related to the pragmatics of language.

What is interesting about this second excerpt from their conversation is that Pedro continues to do mathematics while processing and responding to Angel's question. While it is not clear as to the quality of the mental process, there was evidence that he was able to think mathematically and engage in a conversation with Angel. Using their working memory, Angel is able to retrieve his knowledge of addition and subtraction facts as well as to leverage his linguistic repertoire to engage in multiple mental activities simultaneously, including discussing a strategy to solve the problem, engaging in mental calculations and translanguaging. If both languages existed as separate language systems, going in and across both systems would add to the cognitive load and diminish cognitive efficiency.

The concept of cognitive efficiency comes from at least two core definitions of efficiency (Hoffman & Schraw, 2009; Hoffman & Spatariu, 2008; Paas & van Merriënboer, 1993; Tuovinen & Paas, 2004): competency in performance and ability to perform a skill with a minimum of time and effort. Efficiency as competency in performance suggests a minimally acceptable degree of proficiency related to the performance of a skill. Efficiency as the ability to perform a skill with a minimum of time and effort presumes a high level of competency and performance. In my analysis of Angel's and Pedro's use of language, I am using the latter definition to suggest that retrieving language from one system rather than two would allow them to perform the calculations with less time and effort. It is possible that individuals who have learned a second

language as adults revert to their home language when solving complex problems because it demands less cognitive effort than having to retrieve knowledge from two different language systems. My data seem to point to the fact that for young emerging bilinguals, their linguistic repertoires appear to work as an integrated system. Similarly, my data seem to support that translanguaging, for Angel, served to support his working memory, allowing him to employ more controlled processing on the mathematics problem-solving tasks on which he was working.

Translanguaging and socio-cultural theories of language

While cognitivism offers a lens for exploring mental processes involved in translanguaging, socio-cultural perspectives afford an opportunity to explore the use of language in social interactions. Students in Mr. C's class sat around tables in groups of 3-4 students, an approach commonly used in classrooms to facilitate group work and to encourage mathematical discussions. Group work as a catalyst for mathematical discussion has been extensively researched in mathematics learning (Cobb, 1999; Martin, Towers & Pirie, 2005; Weber et al., 2008). However, even though some research shows positive effects of mathematical group work (Amigues, 1988, Coleman, 1998; Prusak, Hershkowitz & Schwarz, 2012), several studies show that group work is only beneficial when productive group discussions take place (Barron, 2003; McCrone, 2005; Ryve, 2006; Sfard, 2001). A productive group discussion, according to some researchers, is one in which students enter each other's universe of thought (Kieran & Dreyfus, 1998), that is, communication through which students evoke responses that are within each other's meta-discursive expectations (Sfard & Kieran,

2001). This means that, in order for group work to be effective, students must have common ways of interpreting and contextualizing the solution to problems. However, data from the interactions observed in Mr. C's class showed that students' interactions revolved around checking their answers against each other and not their interpretations of the problem or their approaches to solving the problem.

Angel: *Diez…me queda uno nada más…tenemos que sumar*

Ten…I have only one left…we have to add

Pedro: *Diez,* twen…one second*,* twenty-one*, dos, veintidós, quedan uno, uno, dos, dieciséis…se lo está gastando*

Ten, twen..one second, twenty-one, two, twenty-two, one is left, one, two, sixteen…he's spending it

In the example above, Angel states that they need to add. Pedro responds that the fictional character is spending the money, providing a counterargument indirectly, but not explicitly. Neither student engages in a discussion of the interpretation of the problem that led them to decide if they were going to add or subtract. Later in the dialogue, the following interaction takes place:

Pedro: Yes? So, *¿le quitamos?*

Yes? So, do we take away?

Angel: *Sí*

Yes

In this case, Pedro asks directly if they should take away, but once again, neither student offers a justification for that action. Neither student steps into the other's meta-discursive expectation or discusses how they contextualized the problem in order to solve it.

While working in teams could afford students opportunities to reflect on their cognitive processes as well as on their social participation (Krischner, 2001), my data did not provide examples of either type of reflection by students in Mr. C's class or by Mr. C himself. Mr. C did very little lecturing or modeling at the beginning of the class, unlike teachers in other 4th grade classrooms. Instead, he gave his students problems to solve right at the beginning of the math period and called for volunteers to model different ways to solve the problems. While math teachers providing students more opportunities to have the floor provides students with more opportunities to practice speaking mathematically, which in turn helps them learn to use mathematical language (Zahner, 2012), what was missing in Mr. C's class was the scaffolding within a Zone of Proximal Development (Vygotsky, 1978). Zones of proximal development (Vygotsky, 1978) are those spaces in which students have the opportunity to solve a problem with help from others which they would not be able to on their own. Within these metaphorical spaces, students are able to interact and be supported by various forms of scaffolding, like modeling the interpretation of problems, coming up with specific strategies to solve them and testing those strategies, or co-construction of models for how to solve them. Such scaffolding could have been incorporated as emerging bilingual students worked in groups or even when they came up to the board to show how they solved the problem. Instead, only some emerging bilingual students interacted with the teacher- those who chose to show their work on the board- and get his approval or not, maintaining in this way the status differential between the expert teacher and the students. Further, since it was the same students who would volunteer to go up to the board most of the time, this practice privileged those students who were more outgoing and those who already knew how to solve the problems. The rest of

the class only ultimately received the right answers from the teacher and their peers, but not any clues about how to solve the problems. Those students who participated more and understood mathematics better were, in a way, privileged over those who needed help, as Mr. C worked with them at the front, while the rest of the class continued to work in groups without listening to the one-on-one conversation between the teacher and the students at the board.

Moreover, possibly because of the lack of meaningful interactions, my data from this classroom did not show emerging bilingual students using much mathematical language either. While Mr. C's approach to organize students to work in small groups could exemplify a counter-narrative to traditional models of learning, in which students assimilate material that the teacher has selected, there was no evidence of mathematical language in the interactions. In the data, there was no evidence either of Mr. C modeling the use of mathematical language or using mathematical discourse to contextualize problems. I would like to argue that the lack of focus and sophistication in mathematical language used in this classroom resulted in poor mathematical conversations and the lack of these conversations resulted in students lacking the linguistic tools to engage in more abstract mathematical thinking and problem solving.

This lack of evidence of effective mathematical conversations and meaningful mathematical thinking was not the result of translanguaging per se, but the result of poor instructional choices and of poor instructional design. Further, I would like to suggest that while translanguaging provides valuable cognitive affordances in mathematical learning, these are negligible when enacted in ineffective interactions and unsupported learning spaces. In all program models, but especially in bilingual programs, it is critical that teachers are thoughtful

and that they plan, act on, and reflect on their use of language. It is essential that they look to design activities and scaffolds not only for mathematical thinking, but also around language development, specifically language that will enable emerging bilingual students to participate in increasingly more abstract and challenging math learning.

Earlier, I discussed how group work has been identified as an effective strategy in math learning. Cooperative learning is a component of reformed mathematics (deCorte, 2004) because it fosters math learning and social skills (Antil et al., 1998; Cohen, 1994; Johnson & Johnson, 1991; Slavin, 1996; Webb & Palincsar, 1996). However, these results are not guaranteed. It is crucial that math learning spaces are carefully structured and supported. A number of researchers have argued that in order for students to work effectively in teams, they need to learn specific skills to be successful in group work (Johnson & Johnson, 1986; Michealson & Black, 1994; Nastasi & Clements, 1991; Porter, 1993). In addition to having a common goal, students engaged in group work need to be interdependent, engage in dynamic exchanges of information, coordinate task activities and assume various member roles (Johnson & Johnson, 1983; Nastasi & Clements, 1991; Slavin, 1983, 1995). Research has found strong evidence that teachers need to encourage and socialize their students into group work to achieve the desired outcomes of group work (Dunne & Prince, 1997; Johnson & Johnson, 1989; Kutnick, Blatchford & Baines, 2002; Yager et al., 1986; Schadler, 1995). It is unclear from the data if the emerging bilinguals in Mr. C's class were ever explicitly taught strategies to work in groups. Moreover, there was no evidence from interviews or observations in Mr. C's classroom that, aside from having the common goal of solving the problems assigned to them, any other factors for effective group work were present. Mr. C believed that work group was the key to

mathematics teaching, but was unable to elaborate on the role of language in mathematics learning (interview, 05/07/2013).

At first glance, Mr. C's approach was student-centered because he allowed plenty of time for students to work in groups; however, student independence, not interdependence, went beyond work time. Mr. C intervened only when asked or when he noticed that particular groups were struggling with particular concepts or if students' behaviors interrupted others' work. On the other hand, if students were off task but not interrupting others, he would ignore individual students' behaviors.

Pedro: We minus it so tha...*doce*, wait…

We minus it so tha…twelve, wait…

Angel: *Pérame* (whispering)

Hold on…

Juan: (singing in the background "*biri, biri, bam bam*")

Angel: Shut up! *no me gusta esa canchón*

Shut up! I don't like that song (Juan plays with the word song, saying *canchón* instead of *canción*)

Juan: (continues singing)

Pedro: an eight, which makes it *dieciocho, uno, dos, tres, cuatro...más diez...cuatro, ocho,...quedan siete, tres, tres...esto me salió, Angel, ¿está bien? ¡Angel! ¿está bien esta? Uno, ocho, tres, tres...*

an eight, which makes it eighteen, one, two, three, four…plus ten…four, eight,…seven left, three, three…this is what I got, Angel, is it right? Angel! Is this right? One, eight, three, three…

In this excerpt, while Angel and Pedro engaged in discussion related to the task, Juan remained disengaged, singing and at times chatting with girls in a nearby table. While Juan was a smart and bright boy, his attitude and behavior during group work focused on the social and not the academic aspects of the task. This is one example of how lack of specific design and preparation for group work undermined the right to learn for students like Juan. Juan did not have a role as a member of his team and, while he had the same goal as the others in his team, their work was not dependent on Juan's engagement, so neither he nor his group peers had any motivation to keep him engaged. This lack of engagement had repercussions on his mathematical learning and his lack of growth in academic language development.

Purposes for language use

Mr. C explained that he asked his class to work in groups of two or three to ensure that students had the opportunity to talk about the math problems together (interview, May 9, 2013); in other words, he said that group work was really a means to use language for the purpose of learning. He said that he was hoping to use this activity as part of his checking for understanding of the math practices targeted in the lesson, which related to making sense of problems and persevering in solving them (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010)[14]. However, while he shared this goal with me, he did not make this explicit to the students; all he asked them to do was to complete

[14] It is relevant to mention that while he mentioned practices, he was not able to tell me during our interview which particular practice he was focusing on. I looked up the practice in the standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010) in order to provide the context for the discussion.

the activity. In other words, his message to students about their common goal was to complete a task, and not to make sense of problems or even engage in language use.

From a linguistic perspective, Mr. C's goals for language use were not communicated with students. Further, his goals were different from those of other bilingual teachers in the school. Although this was a bilingual classroom with the goal of developing proficiency in two languages (interview with principal, May 7, 2013), Mr. C did not state any clear language goals for instruction. Mr. C's thoughts on his students' language were as follows:

"El objectivo principal es que…el inglés ya se lo saben…o sea, no tienen la *proficiency* en *reading, writing*, pero ellos tienen el *social*, ellos hablan el inglés perfectamente."

The main objective is that…they already know English…that is, they already know English…they do not have the proficiency in reading, writing, but they have the social; they speak English perfectly.

Mr. C's statement above shows a lack of awareness of academic registers and his belief that his students have enough language to be successful. Throughout my interview with him, Mr. C never mentioned the role of Spanish or his goals for the use of Spanish by his students even though he used Spanish constantly as he discussed teaching, learning and his personal life. He used translanguaging throughout the day, whether he was teaching, being interviewed or talking with colleagues.

Mr. C: *A ver muchachos, ¿Quién ya terminó? Recuerden que en la* back page *hay más*, *¿eh?*

> Let's see, young people, who has finished? Remember that on the back page there are more [problems], eh?

In the previous example, Mr. C is talking to his students. Mr. C shared that he talks like his kids as a way to relate to them. However, he was unable to elaborate on other uses of language (interview, 05/07/2014). The emerging bilinguals in his class used translanguaging in similar ways. Below is an example of translanguaging used in student-student interaction.

> Pedro: Yes? So, *¿le quitamos?*
>
> Yes? So, do we take away?
>
> Angel: *Sí*
>
> Yes

In the previous example, Pedro asks for confirmation on whether the problem requires subtraction. In this particular example, Pedro used the "official" purpose of the words, in other words, he asked for confirmation and used the linguistic features appropriate when asking for confirmation. However, in other interactions, many of the emerging bilinguals in the class included a "hidden" purpose in their words. Both *official* and *hidden* are terms borrowed from discussions about communicative purposes used in determining a genre for a text (Swales, 1990; Askehave & Swales, 2001). Swales (1990) comments:

> Placing the primary determinant of genre-membership on shared purpose rather than on similarities of form or some other criterion is to take a position that accords with that of Miller (1984) or Martin (1985). The decision is based on the assumption that, except for a few interesting and exceptional cases, genres are

> communicative vehicles for the achievement of goals. At this juncture, it may be objected that purpose is a somewhat less overt and demonstrable feature than, say, form and therefore serves less well as a primary criterion. However, the fact that purposes of some genres may be hard to get at is itself of considerable heuristic value. Stressing the primacy of purpose may require the analyst to undertake a fair amount of independent and open-minded investigation, thus offering protection against a facile classification based on stylistic feature and inherited beliefs, such as typifying research articles as simple reports of experiments. (p. 46)

In this passage, Swales suggests that purpose is not always overt and it is hard to identify. In his analysis of texts, Askehave (1999) shares similar concerns, and names these types of purposes "hidden," as opposed to "official" purposes, which are the communicative vehicles for the achievement of explicit goals. Hidden purposes are subjective, but they provide a more comprehensive understanding of the conversation, what some may recognize as part of the pragmatics in the study of language. For example, when Angel announces, "*tenemos que sumar*" (we have to add), he is providing information to his peers about what has to be done. However, pragmatically, he is requesting confirmation or clarification from them before proceeding. This becomes clearer from the field notes about the observation, which describe him waiting for a bit after announcing that they have to add and checking on Pedro's paper to see what he was doing.

The table below highlights some language samples from the conversations that exemplify the purposes for the language used between the boys, taking into consideration both official and hidden purposes:

Table 5. Examples of and purposes for the use of translanguaging

Language	Purpose/Intent
Angel: *Diez…me queda uno nada más…tenemos que sumar* Ten…I have only one left…we have to add	Request clarification Angel calls out "Ten" to let others know the date he is working on. Then, he states, "we have to add." Rather than providing information, he is letting others know that he is planning on using addition to solve the problem and hoping for clarification or confirmation.
Pedro: *Diez*, twen…one second, twenty-one, *dos, veintidós, quedan uno, uno, dos, dieciséis…se lo está gastando* Ten, twen...one second, twenty-one, two, twenty-two, there is one left, one, two, sixteen…he's spending it all	Provide clarification Pedro calculates out loud, but then makes the comment, "he is spending it all," to let Angel know that the money is going away and maybe questioning Angel's assumption and suggesting, using subtraction, which he is using, but Angel had not realized even though he had peeked at Pedro's paper
Angel: Wha…?	Providing confirmation Angel let's Pedro know that he has heard his comment
Pedro: This one *se'ta gastando este dinero, ¿verdad?* This one is spending this money, right?	Requesting confirmation Pedro checks with Angel once more to make sure he is right in using subtraction
Angel: Yea, *¡qué payaso!* [laughter] *¿es el* ten? Yea, what a clown [laughter] is that number ten?	Requesting confirmation Angel realizes that Pedro is right, so he makes a statement in response to Mr. X wasting money
Pedro: an eight, which makes it *dieciocho, uno, dos, tres, cuatro...más diez...cuatro, ocho,...quedan siete, tres, tres...esto me salió, Angel, ¿está*	Describe and request confirmation Pedro talks out loud, describing his mental calculation, but without producing any oral explanation. Then, at the end, he requests confirmation from Angel.

Language	Purpose/Intent
bien? ¡Angel! ¿está bien esta? Uno, ocho, tres, tres... (an eight, which makes it eighteen, one, two, three, four…plus ten…four, eight…seven left, three, three…this is what I got, Angel, is this right? Angel! Is this right? One, eight, three, three…)	

From the table above, we can see that the conversation between the boys revolved around checking how many problems they had solved or confirming answers. Angel and Pedro never engaged in deeper co-construction of knowledge, as we discussed earlier in this chapter. On the other hand, this evidence can be used to show that translanguaging, like other forms of movement across languages, is not haphazard or ungrammatical, but instead, it shows that translanguaging happens in particular situations, like during the problem solving situation shown here, and that it is used by emerging bilinguals who are competent in their languages, like Angel and Pedro, in the previous example (Grosjean, 2010). Others (Baker, 2006; Freeman & Freeman, 2011; Grosjean, 2010) have created similar tables to identify the purposes for code-switching, and to highlight the fact that code switching is governed by precise language rules.

Mr. C used translanguaging in similar ways as his students. However, it is unclear if he was using the language in those ways because his students did or if the students were using language in ways that Mr. C modeled. Mr. C compared his language use to his pedagogy. He attributed many of his approaches to teaching 4th graders to his experiences teaching high school completion degree programs (General Education Development [GED]). His approach, as he named it, was "*mezclado.*" It is important to emphasize that it is not the moving across languages as one integrated system that was the problem, but the lack of reflection and planning to maximize the use of translanguaging in order to show how it can be used as a mediating tool unique to these students:

"Y es que yo estoy acostumbrado a enseñar todo revuelto y rápido".

I am used to teaching everything in an integrated and quick way

His units were not clearly based on one single standard; he always combined several standards and reviewed learned concepts. His focus, rather than on standards, was on practices found in the standards that cut across various standards, like making sense of problems and persevering in solving problems (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010). Once again, it was not that addressing more than one standard is not effective, but that the lack of reflection about the goals in his instruction did not provide evidence of what particular standards or practices were being covered. Without explicit goals, it was hard to identify the specific mathematical strategy or concept that he expected students to learn. Although teaching GED was one of the reasons he shared for his approaches to teaching and learning, he also said he felt that this way, the

chamacos[15] would be ready for the state test. He was worried that if he changed his approach, his students would forget the content by the end of the school year, when the state test would be administered. However, without knowing what particular areas he was covering, it would be just as hard to know if the students were ready.

> *"Con ellos, hablo inglés, hablo español, pero uso mucho el mezclado, o sea, porque…el objectivo principal es que…el inglés ya se lo saben…o sea, no tienen la* proficiency *en* reading*,* writing*, pero ellos tienen el social, ellos hablan el inglés perfectamente."*
>
> With them, I speak in English, in Spanish, but I mix them a lot because…the main objective is that…they already know English…they do not have the proficiency in reading, writing, but they have the social; they speak English perfectly.

The quote above shows that he believes the main objective is for the students to learn English, but he also believes that his students have already achieved that. He does not realize that his students struggle with language and the role that language has in his students' access to content. He does not make distinctions between genres in English or how language is used in mathematics. Because of this, he does not plan for language instruction and lacks an understanding of how language growth can be supported or developed. While Mr. C's quotes provide a lot of rich data to discuss, in this chapter I will only use them to highlight his thoughts on "mixed" pedagogy and "mixed" language. Mr. C views himself as an advocate for his students and he believes that helping them to

[15] Chamaco is the colloquial term used in Mexico for boy or girl

be successful in large-scale tests is a form of advocacy. In the quote about mixing the topics and standards, his rationale was that by doing so, they would be better prepared for the test.

On the other hand, Mr. C's quote about language was embedded in a conversation about ways in which he connected with his *chamacos*. He recognized that his students were developing two languages at the same time and that mixing languages was natural for them. He mentioned that he came as an adult to the United States, but that he felt very comfortable mixing language. This was true in all of my interactions with him, he mixed codes at all times of the day, both in social and professional situations, while teaching and after school. Mr. C said this practice was a way to create a sense of community and belonging for his students. He believed that by connecting with them at this level, they would learn better. However, the data collected did not provide sufficient evidence of a sense of community among the emerging bilinguals in Mr. C's class. From a sociocultural perspective, in a school community, mathematics learning can be conceptualized as participation in mathematical practices and as changing in participation in these practices (Rogoff, 2003). From a cognitive perspective, mathematical learning is more than being able to do arithmetic. Mathematical thinking is a process demonstrated by deep mathematical knowledge, general reasoning abilities, knowledge of strategies and skills to communicate solutions, among others (McLeod, 1992). However, data from this classroom did not provide any evidence of mathematical learning from either a cognitive or a sociocultural perspective. Neither did it provide any examples of mathematical practices, such as constructing

representations, making arguments, reasoning about mathematical objects, explaining their thinking, or constructing proofs (Schoenfeld, 2002).

Aside from community building, when Mr. C used translanguaging during instruction, it was not always clear what the specific or strategic purpose was for its use. While he was able to use all of the languages in his linguistic repertoire as part of an integrated system, his lack of conscious, strategic and thoughtful planning resulted in missing opportunities to maximize his students' use of translanguaging as a practice for mediating learning.

> (...Mr. C speaks over all the voices...)
>
> Mr. C: *A ver muchachos, el día quince pasaron dos cosas*, right? *Fue un* deposit *y fue un* check. *Nos...lo que se tienen que fijar es que el cheque del día quince está bien grandote.*
>
> Let's see, young people, on the fifteenth, a couple of things took place, right? There was a deposit and a check. We…what you have to do is pay attention that the check on the fifteenth is very large
>
> (Mr. C turns to work with a student at the board and class returns to work in groups)

In this example, Mr. C is trying to highlight an important piece of information in the problem: the fact that on the same date, there are two pieces of data and that one requires them to add and the other requires them to subtract. Some students may realize that this is an important clue because Mr. C is pointing it out, but not all students may understand why it is important from a mathematical thinking perspective. He talks to the class as a whole, but does

not negotiate his interpretation with his students. He shares this information and then sends the students back to work in their groups.

From a language perspective, he speaks in Spanish, crossing into English when requesting confirmation ("right?") and to label the transactions in the problem ("deposit" and "check"). Aside from marking confirmations and specific information, he does not follow up with critical questions or talk about the implications of that data. This does not allow an opportunity for his comment to help students to clarify a point. Not using translanguaging strategically to restate information, ask critical questions or deepen understanding represents missing the potential opportunity to engage emerging bilinguals in meaningful purposes for translanguaging.

Recognizing the use of emerging bilinguals' languages as repertoires for teaching and learning is a topic in research that points to positive outcomes in bilingual education (August & Shanahan, 2006, Genessee et al., 2006). However, bilingual education has traditionally supported the separation in the teaching and learning of languages with the purpose of avoiding "cross-contamination"(Jacobson & Faltis, 1990, p.4). It has been within the last decade that research has begun to question the separation of language and look into the advantages of using translanguaging practices as tools to mediate learning (Anderson, 2008; Arthur & Martin, 2006; Creese & Blackledge, 2010; Cummins, 2005; García, 2007; Hornberger, 2002, 2004, 2008; Lin & Martin, 2005) and as "valid" pedagogical tools (Arthur & Martin, 2006, p. 197). In spite of the theoretical support, I was unable to support these ideas with evidence from Mr. C's class. As suggested earlier in the chapter, this was not due to the translanguaging

practices that Mr. C used, but to the lack of thoughtful and strategic use of translanguaging to engage in co-construction of knowledge, negotiation of meaning and deeper learning.

Summary

In this chapter, I theorized translanguaging practices as the movement across multiple languages and language varieties as part of a single communication system. Using cognitive and socio-cultural perspectives, I proposed translanguaging practices work as internal micro-processes that help emerging bilinguals to engage in multiple simultaneous mental processes. Socio-cultural lenses helped me to examine translanguaging practices as a tool to mediate learning of mathematical concepts and engage in mathematical practices in social interactions. I used selected representative samples of data to support my theory of translanguaging practices maximizing simultaneous mental processes during problem solving, co-construction of meaning and the development of deep knowledge of mathematical concepts. However, from the data, it was also evident that the lack of structure and poor design of instructional activities and learning spaces resulted in students being unable to work effectively in groups to deepen or extend learning.

The use of translanguaging by the teacher in the classroom focused opportunities in the use of translanguaging around simple requests for or confirmation of information and not on questioning the interpretation and contextualization of problems to solve or on specific learning strategies. An implication of these observations is that while translanguaging can be a powerful tool in teaching and learning that affords emerging bilinguals unique opportunities to maximize their learning, the lack of explicit conversations and appropriate modeling of its use

to negotiate deep mathematical concepts and mathematical conversations significantly limits its potential.

CHAPTER 5: PEDAGOGIA DEL PUENTE

Caminantes, no hay puentes, se hace puentes al andar

Voyager, there are no bridges, one builds them as one walks

Anzaldúa, 1987, p. 5

Introduction

Anzaldúa's words about bridges were a call for women to action, to move out of the shadows of oppression into a new reality of hope, love and self-nourishment. The image of the bridge, Anzaldúa advised, was not only about action, but also about sharing, about connection and interdependence (1987). For Mexican-Americans, the bridge has also symbolized border crossing –physical border-crossing, linguistic border crossing, and cultural border crossing- in a sense, a crossing that also has a sense of connection and interdependence between two countries, their cultures and their languages. Translanguaging, viewed as the ability of emerging bilinguals to move between and across languages, has also been defined as bridging (Beeman & Urow, 2013). In my research, I found the concept of bridging as a major ideological force behind the pedagogy of several of the teachers in my study. In this chapter, I would like to explore the concept of bridging and its use in two-way immersion classrooms as a pedagogical tool, and problematize its decontextualized use as part of a language program.

In the preceding chapter, I discussed translanguaging as a tool to mediate learning, but translanguaging has also been used as a concept, a theoretical construct, a set of practices, and most recently, there has been an increased interest in looking at pedagogical implications for the multilingual classroom (Canagarajah, 2011; Creese & Blackledge, 2010; García, 2009, 2011;

Hornberger & Link, 2012; Velasco & Garcia, 2014). Studies have been conducted on the impact of instructional strategies based on the concept of translanguaging, such as explicit instruction on cognates (Dressler et al., 2011) and translation (Orellana, 2009). The rationale behind these strategies is that they promote cross-linguistic transfer (Koda & Zehler, 2008), which leads to the development of metalinguistic awareness, a skill that has been shown to promote higher levels of academic success (Jiménez, García & Pearson, 1996). In this chapter, I will explore the use of languages in a bilingual classroom using the lens of translanguaging. In the first section of this chapter, I will discuss key components of a program model that is based on the concept of translanguaging as a bridge and its affordances and limitations. In the second section, I will examine the implications of program models for the way in which language is enacted and used in them and whether the bridging component of the program maximizes or hinders language use. In the third section of this chapter, I will explore translanguaging as pedagogy and the considerations to take into account when trying to incorporate translanguaging into formal bilingual program frameworks, such as bridging. Finally, toward the end of this chapter, I will examine issues of language power and status related to the use of translanguaging in a bilingual classroom observed in this study.

Translanguaging in bilingual programs

In literacy development, traditional research has historically been conducted through a monolingual perspective, even in multilingual spaces. Recently, a shift has begun to emerge in approaching literacy development in emerging bilinguals as biliteracy development (de Jong, 2011; Escamilla et al., 2010). A five-year research study conducted on biliteracy development

beginning in 1st grade showed positive literacy gains in both languages in reading and writing, and that these effects increased with sustained practice (Escamilla, 2010). This biliteracy research was created from the premise that emerging bilinguals required a bilingual environment for biliteracy development, and researchers provided teachers with instructional frameworks, strategies and assessments that leveraged bi-directional literacy relationships and emerging bilinguals' multiple linguistic repertoires in their development of biliteracy. Based on this work, other instructional frameworks have been developed for teaching and learning in contexts beyond biliteracy and as a way to contest monolingual policies like strict language separation (Beeman & Urow, 2013).

Newberry School District, where my study took place, adopted a framework called Teaching for Biliteracy, developed by consultants at a state-funded center that provides resources and assistance to teachers and administrators in the state where Newberry is located. The key guiding principle of the Teaching for Biliteracy framework is that guiding emerging bilinguals to metalinguistic awareness is "critical to the effective teaching of biliteracy and [that this is what] sets biliteracy instruction apart from monolingual literacy instruction" (Beeman & Urow, 2013, p. 5). This framework has three parts: Spanish instruction, English instruction, and the Bridge. Teaching for Biliteracy makes a distinction between the terms *Bridge (capital B)* and *bridging*, a distinction that is relevant to the discussion in this chapter. The Bridge is defined as a time during instruction, typically at the end of a unit, when explicit and intentional instruction about the similarities and differences between the two languages occurs. This space offers emerging bilinguals opportunities to engage in a contrastive analysis of the two languages of instruction and to facilitate the transfer of academic content across

languages (Beeman and Urow, 2013). Bridging, on the other hand, is a term used in the framework interchangeably with translanguaging; it is more flexible and spontaneous and may not even include the teacher. In other words, it is not part of the instructional planning of the teachers. While bridging involves the use of cross-linguistic strategies and leads to the development of metalinguistic awareness, it is not meant to take place in formal spaces during English or Spanish instruction (Beeman &Urow, 2013). In other words, emerging bilinguals are not allowed to use translanguaging freely and creatively during instruction, but only during a specific time, called the Bridge.

Bilingual teachers in the Newberry District attended training on this framework, along with Ms. Palmetto, the Bilingual Program Director, according to interviews with Ms. Palmetto (interview, May 31, 2013) and Ms. Dewey Principal of Hixton Elementary (interview, May 7, 2013),. As with many other professional learning tools, the keys to success in implementation go beyond just having teachers attend the workshops. Administrators (e.g., principals) are another key to the success of students because they are instrumental in providing vision, time and resources to support teachers' professional learning and, ultimately, academic success for all students (Leithwood et al., 2004; The Wallace Foundation, 2012).

At this point, it is important to recognize the different contexts for bilingual teachers in Newberry School District. The district administrator, Ms. Palmetto, shared some of the history behind the program during a formal interview I held with her (May 31, 2013). Before Ms. Palmetto first began the Two Way Immersion (TWI) program in 2007, Newberry offered a Transitional Bilingual Education (TBE) program for their Spanish speaking emerging bilinguals. In 2007, the TWI program started with two classrooms and about 50 emerging bilinguals,

growing to 6 classrooms by the time of the study. However, in the first few years of the TWI program, only some Spanish speaking families enrolled in the program, leaving two additional classrooms of emerging bilinguals still in a TBE program. As the years went on and the program grew, Ms. Palmetto made sure that the TBE program morphed into a Developmental Bilingual Education (DBE) program, also known as Late-Exit or Maintenance Program, which traditionally continues up to 5th grade, to ensure as many emerging bilinguals as possible had a chance to develop their bilingualism and biliteracy. At the time of the study, this first group of emerging bilinguals was in 4th and 5th grade. Mr. C's class, from Chapter 4, was one of the classes from the DBE program. The two classrooms where the data in this chapter were collected were classrooms from the TWI program. It is important to note that the bilingual teachers in the TWI program were the ones attending the professional learning opportunities related to Teaching for Biliteracy. The bilingual teachers from the TBE program were not part of this professional learning opportunity. During my interviews with the bilingual teachers in the transitional program, many of them were aware that there was a language allocation and that language was used in strategic ways, but were not familiar with any of the language policies of the TWI or the details about the program model.

Another key to successful implementation of professional learning for the purpose of student academic achievement is the format of the professional learning. Job-embedded, well-designed professional learning has been shown to increase student achievement over one-shot, fragmented workshops (Darling-Hammond et al., 2009; Yoon et al., 2007). In the Newberry School District, Ms. Palmetto and her teachers attended the institute, but the book published on the framework was also purchased for all of her teachers and she conducted a book group

on it. Ms. Palmetto acted, according to the bilingual teachers interviewed for this study, as a coach and resource on the framework to all teachers and administrators in the district, even though the only bilingual teachers who were officially expected to use the framework at the time of the study were those who were part of the TWI program. In addition to Ms. Palmetto, one of the state consultants who developed the program visited the school and consulted with the teachers from the TWI program about once a month for two years. At the time of the study, this support had just been cut due to state changes in professional learning funding.

A third key to academic achievement and the last one I will address in this chapter through the lens of professional learning is the creation and maintenance of professional learning communities among the teachers implementing programs or strategies. The concept of professional learning communities has become very popular in schools and districts as a practice to improve schools. The original concept was to create a community in which teachers shared and supported each other's practices in an ongoing, reflective, collaborative, and inclusive manner in order to promote learning and professional growth (Stoll et al., 2006). Various versions of the concept have been adapted in various school contexts with effective results (Allen et al., 2011; Brantlinger et al., 2011; Ingersoll & Strong, 2011; Lewis et al., 2006; Roth et al., 2011; Thompson et al., 2004). While all of the bilingual teachers had similar content to teach and similar issues with respect to teaching in two languages, the fact that the resources available to TWI and TBE bilingual teachers were not the same limited their interaction as a professional learning community. The teachers in the two programs did not have common time for collaboration either, which was another factor that limited the consistency in vision for the education of emerging bilinguals.

While Ms. Palmetto and Ms. Dewey told me that they supported bilingualism, there were other contextual factors that pointed to English as the language with more power and status. In a school with 75% of its emerging bilinguals receiving instruction in Spanish for 50% of their day, the only books in the library in Spanish were limited to six small shelves (Figure 4). While they had both fiction and nonfiction, about a third of the books were picture books that were not always appropriate for 4th and 5th grade independent reading.

Figure 2. Picture of Spanish section in Hixton Elementary's library

In addition to the lack of Spanish or bilingual books in the library, as one walked through the hallways, it would have been hard to know this was a bilingual school, with most signs and notices in English.

Figure 3. Picture of a sign in the back of Hixton Elementary's library

Further, towards the end of the year, when large-scale, high-stakes, annual state content assessment was scheduled, most of the instruction in Spanish was replaced by test practice, which was in English because the assessment was in English. For mathematics and language arts this was not an issue, because both classes were taught in English for 5th graders.

From these examples, one can conclude that while the discourse revolved around the importance of being bilingual and speaking Spanish, when it came to resources, visibility, and assessment, the language that counted was English. For a translanguaging pedagogical model, such as the Bridge, to work, bilingual programs need to commit more than the daily schedule to balanced attention to both languages. It should include a commitment to resources as well as to transforming the local ecology to reflect the district's commitment to bilingualism.

Translanguaging in Action

Ms. Lucy and Ms. Martínez were the bilingual teachers in the 5th grade two-way immersion classroom. They shared two classes, each teaching for half the day for each class,

each teaching in a different language. Each class had 24 students, 12 emerging bilinguals who identified their home language as Spanish and 12 emerging bilinguals who identified their home language as English. Ms. Lucy was the teacher who worked in English and Ms. Martínez conducted her instruction in Spanish. Ms. Lucy spoke enough Spanish to conduct her own parent-teacher conferences; however, she did not feel comfortable enough in the language to teach in Spanish. Ms. Martínez, on the other hand, was an emerging bilingual herself and felt comfortable in either language. Using the Teaching for Biliteracy framework to plan for instruction, Ms. Lucy and Ms. Martínez planned the strategic use of both English and Spanish: Ms. Lucy would teach math units in English and Ms. Martínez would do the Bridge in Spanish.

At the time of the observation, Ms. Lucy and Ms. Martínez were working on a unit on perimeter and area, related to the 4th grade Common Core Math Standard on measurement and data[16]: (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010). It is important to note that this particular standard did not match the grade level of these students. While the state has adopted the Common Core Standards, it would appear from the content of instruction that, at the time of this study, the curriculum was not yet aligned to the state standards. This particular standard expects that students are able to apply the area and perimeter formulas for rectangles in real world and mathematical problems.

Ms. Lucy taught the unit in English and after students had completed it in English with her, Ms. Martínez planned for opportunities for the emerging bilinguals in her class to make

[16] While neither one of the teachers indicated a standard, I was not able to find a 5th grade math standard in the CCSS related to perimeter or area.

cross-linguistic connections. She began by posting a list of words in Spanish with their English translation side by side. She worked with the emerging bilinguals to compare and contrast the two sets of words, focusing on cognates (e.g. perímetro and perimeter, área and area, and multiply and multiplicar). After giving the equivalents terms in Spanish for the terms provided, she and the class solved several problems together in which they had to decide to use perimeter or area. Ms. Lucy stood by an overhead projector asking students for input on how to solve the problem. First, students had to say if they would use perimeter or area, and then they would tell her what numbers to write in the mathematical expression, including the result. Finally, she handed out worksheets with similar problems to the ones the class solved together, which students turned in at the end of the period. Below is an excerpt and translation of the worksheet that Ms. Martínez handed out to her students:

Table 6. Transcription and translation of mathematics handout[17]

Resuelve cada problema incluye un dibujo para el problema. Una vez que tengas la respuesta explica como resolviste el problema y como sabes que tu respuesta es correcta.
Solve each problem include a drawing for the problem. Once you have the answer explain how you solved the problem and how you know your answer is correct.
Perímetro y Área
Perimeter and Area
Danny tiene un jardín de rosas rectangular que mide 8m por 10 m. Necesita agregarle fertilizante. Si una bolsa de fertilizante puede cubrir 16m^2. ¿Cuántas bolsas necesitaría comprar para poder cubrir todo el jardín?
Danny has a rectangular rose garden that is 8m by 10 m. He needs fertilizer for it. If a bag of fertilizer can cover 16 m^2 . ¿How many bags would he need to buy to cover the whole garden?
Dibujo./ Drawing.
Lo que hice para obtener me respuesta fue…
What I did to get my answer was…

Throughout the period, students were given the choice to work alone, in pairs, or in small groups. They sat at tables, with three or four students sitting at each table, and Ms. Martínez worked at the front of the room on a whiteboard. Most students worked with one or two peers at their table. A few students chose to work independently.

This was the Bridge portion in the lesson. Since the lesson had been learned in English, during the Bridge students were expected to work on extending activities that included the same concepts, but in the other language, Spanish, as a way to transfer the concepts across languages. Even though this was the Bridge in the Spanish portion of the lesson, all emerging bilingual conversations I was able to hear as I walked throughout the classroom were in English.

[17] The excerpt has been revised. For original text of the complete handout, please see Appendix B.

Further, the conversations were not about strategy, but mostly about the right answer. Most emerging bilinguals approached a problem by solving it as perimeter, and when asked why, they would switch to area, without really questioning the rationale for using one or the other. Ms. Martínez sat with several groups, talking through the problems and guiding them towards using perimeter or area through thoughtful questions. Emerging bilinguals from other tables would gather around and go back to their tables saying, "We have to use perimeter/area," depending on the problem. Since there were only two problems, one was meant to elicit the use of perimeter and the other of area, so most students, once they had used perimeter or area on one, would use the other approach in the other problem.

When writing in Spanish, emerging bilinguals would ask peers how to say individual words in Spanish, but beyond these types of requests only English was used in interactions, even by emerging bilinguals who identified Spanish as their home language. Later in the day, Ms. Martínez told me this is a challenge she faces in her class:

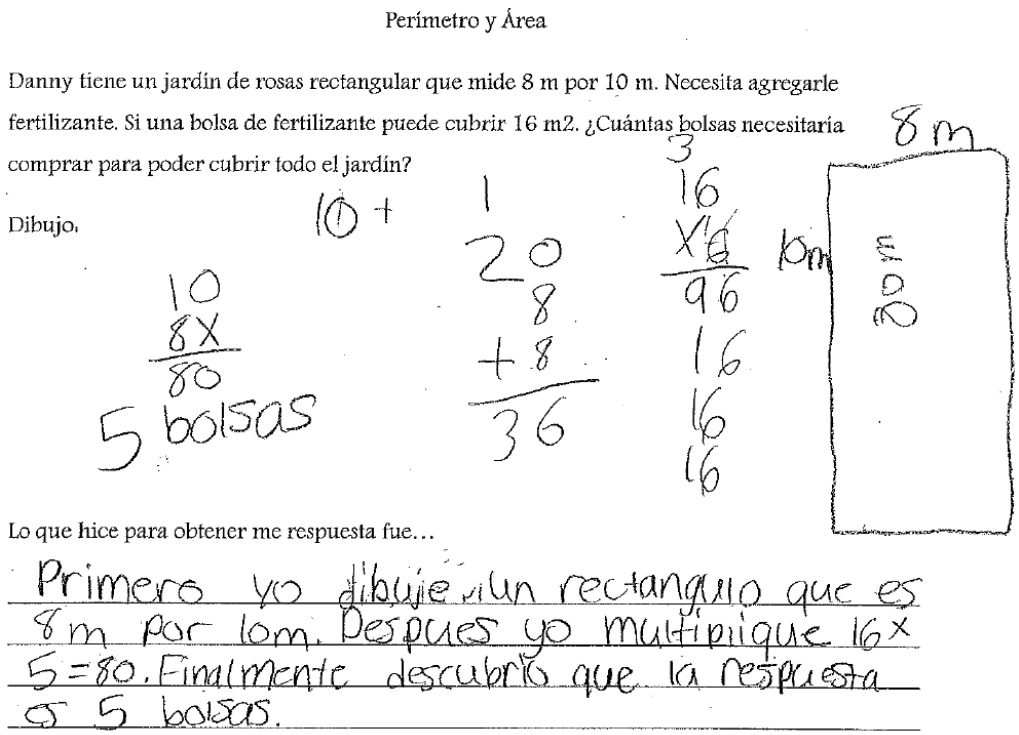
> Ms. Martínez: The challenge in my room is keeping the kids in Spanish. I mean, it's really hard to say only Spanish, only Spanish, because I remember when I was kid and I grew up in bilingual classes and it was only English, only English and if you spoke Spanish, it was Oh my gosh, and you were sent to the principal or something, and I don't want that! (Ms. Martínez, interview, 01/30/2014).

Ms. Martínez' comment reflects a sense of advocacy for the use of home language in education. During the Bridge, she did not want to force her students speak in Spanish because

she did not want them to have similar experiences to her. However, she translated her personal experiences related to the marginalization of her own language, a minority language in the community where she grew up, to the issue of students using the language of power and refusing to use the marginalized language, Spanish, during instruction, under the rationale that English is the home language of half of the students. However, English was clearly the language with higher status in this school; all high stakes tests were conducted in English and all signs throughout the building were also in English. Students whose home language was Spanish also chose to use English, like their peers. Latino students, whose families and ethnic groups have been marginalized by their economic, social and legal status in the community outside the school, remained in a marginalized space within the bilingual community inside the school and so did their home language. While the school ran a DLI program, Spanish was marginalized as represented by the absence of work displayed in Spanish, lack of main office staff who spoke Spanish and could welcome families, and limited conversations in Spanish in common spaces. I will return to these issues of language status and power later in this chapter. While the program had adopted an instructional model that included not only Spanish, but also a time for students to translanguage, there was no advocacy or models for the use of Spanish or translanguaging in the classroom or the school.

The photo below shows the work of a student who completed the assignment:

Figure 4. Student work before any revisions



Perímetro y Área

Danny tiene un jardín de rosas rectangular que mide 8 m por 10 m. Necesita agregarle fertilizante. Si una bolsa de fertilizante puede cubrir 16 m2. ¿Cuántas bolsas necesitaría comprar para poder cubrir todo el jardín?

Dibujo.

10 + 10 + 8 + 8 = 36

10 × 8 = 80

16 × 6 = 96

5 bolsas

8m

10m

Lo que hice para obtener me respuesta fue…

Primero yo dibuje un rectangulo que es 8m por 10m. Despues yo multipliique 16 x 5=80. Finalmente descubrí que la respuesta es 5 bolsas.

First I drew a rectangle that is 8m by 10m. Then I multiplied 16 X 5 = 80. Finally I discovered that the answer is 5 bags.

This student solved the problem and included her work and a drawing. However, in her explanation of the strategy she used, the language she produced was three statements that were loosely connected to each other and that neither describe the sequence to solve the problem nor explained the selection of the strategy. In spite of the limited amount of language used and the poor use of forms and conventions in Spanish, this student wrote more than most students in the class. Many of them left the part where they were supposed to explain their answer blank.

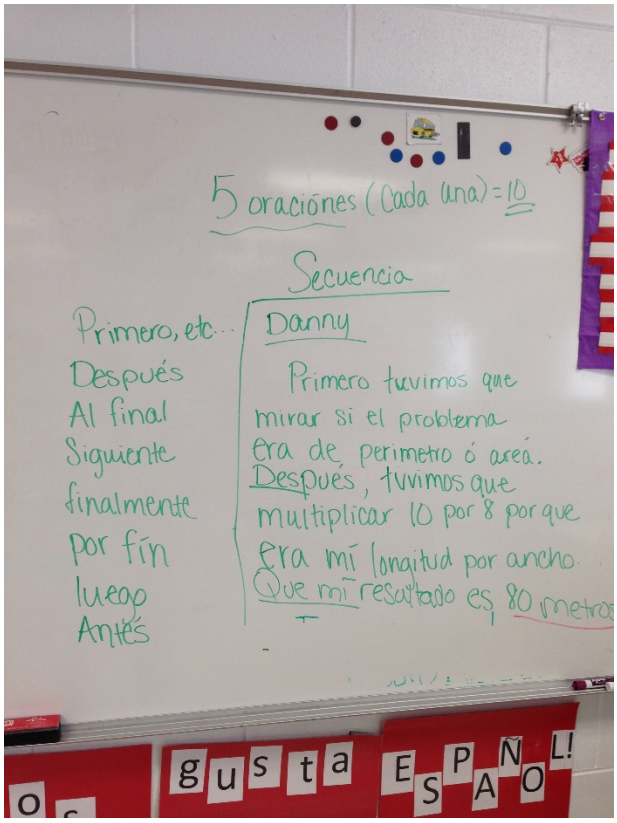
After debriefing at the end of the day, Ms. Lucy and Ms. Martínez decided that emerging bilinguals needed an extension activity that elicited language beyond what they had seen on the completed worksheet. Together, they decided to extend the Bridge into a writing activity, again, in Spanish, as a way to elicit more language than what they had produced. Therefore, the next day Ms. Martínez asked their emerging bilinguals to write an explanation of how they solved the problem using sequential language. As a large group, they brainstormed sequential language in Spanish that they could use in their writing. About ten different emerging bilinguals-mostly emerging bilinguals who spoke English at home-shared words they considered sequential vocabulary. In one instance, one of the English speakers who was called on did not know the answer and when she asked a Spanish speaking emerging bilingual, she just shrugged her shoulders. Immediately, another English speaker shouted out another word for her. It was unclear from the activity if Spanish speakers really did not remember the Spanish words for sequential language or if they did not want to participate.

Next, Ms. Martínez facilitated a shared writing activity. Shared writing helps educators to make the writing process concrete and visible to students by having teachers and students compose a text together, with each contributing ideas and language. In this strategy, typically, the teacher facilitates and scribes the text. The benefits of this activity include reinforcement of reading, participation of all emerging bilinguals, close examination of texts, attention to convention, and an emphasis on composition (Routman, 1994).

Most emerging bilinguals who participated in the shared writing activity were Spanish speakers. The photograph below shows, on the left, the list of words Ms. Martínez captured

from the brainstorming session with the emerging bilinguals, and the shared writing that she and her class did together.

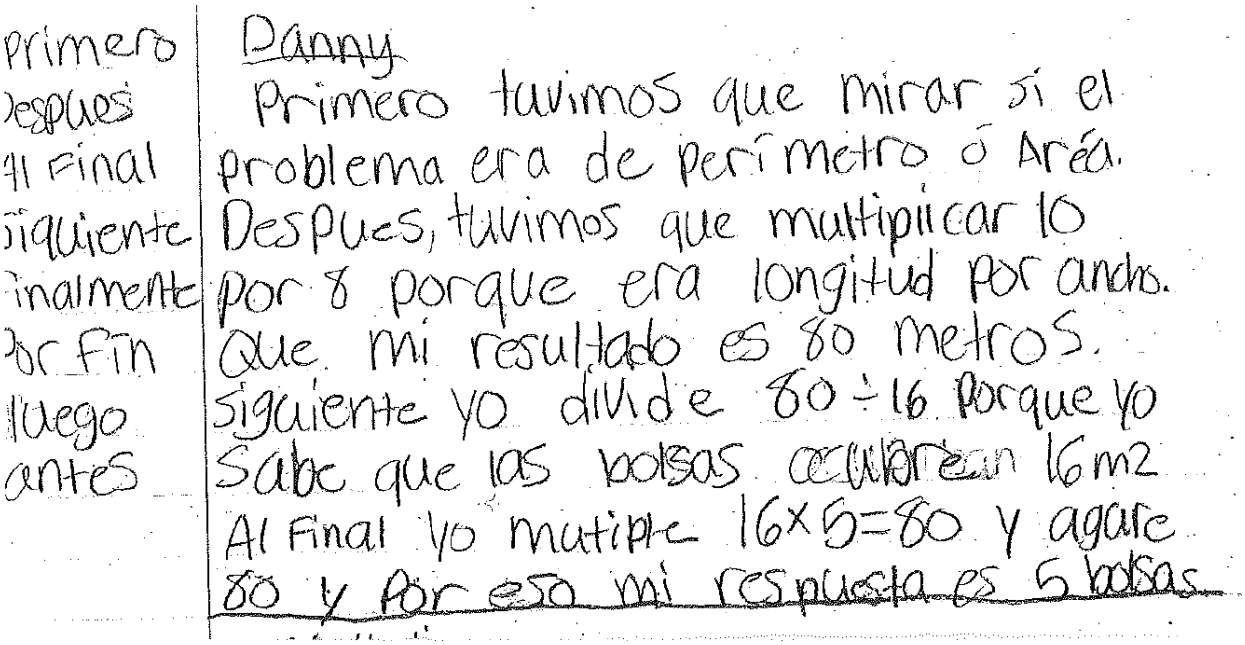
Figure 5. Picture of the whiteboard showing teacher's model (right) and language brainstorm (left)



On the right of the photograph, Ms. Martínez modeled the writing of an explanation and asked the students to write 5 sentences per explanation. A student asked if they could work with a partner and while Ms. Martínez agreed, she did not make it a requirement. Since there were two questions that required an explanation, she wrote an equal sign and a 10 underlined on top of her model explanation. After the sharing activity, emerging bilinguals worked at their seats on their compositions. Again, many emerging bilinguals talked to peers to ask for specific vocabulary or peeked at each other's papers to see if they were on the right track. The next

picture shows an exemplar of student work. This is from the same student who completed the previous writing sample, but after Ms. Martínez had engaged her class in shared writing the next day.

Figure 6. *Student work after revision*



Translation: First we had to see if the problem was about perimeter or area. Then, we had to multiply 10 by 8 because it was length by width. That my answer is 80 meters. Next I divides 80/16 because I knows that the bags cover 16 sq. m. At the end I multiple 16 X 5 = 80 and I took 80 and that is why my answer is 5 bags.

Comparing this emerging bilingual sample to the shared writing produced by Ms. Martínez and her class, it is evident that the emerging bilingual who composed the sample used the model from the shared writing as a formulaic structure, that is, the emerging bilingual used the exact same language as in the model, changing the words related to the numbers specific to the information in their problem. Using models and substituting words or phrases in the model

is a language skill typical of emerging language learners (TESOL Standards, 2006; WIDA SLD Standards, 2012).

Figure 7. Excerpt from WIDA's Performance Definitions

Level ↓ | Linguistic Complexity ↓ | Forms and Conventions ↓ | Vocabulary Use ↓

2 Nivel emergente	• Expresión de ideas aisladas • Frases u oraciones simples	• Formas gramaticales repetitivas que usan patrones propios al tema • Frases y oraciones de patrones repetitivos relacionados al tema	• Uso de lenguaje general • Uso de palabras o expresiones cotidianas y escolares relacionadas al tema
	• Palabras, frases o lenguaje entrecortado	• Formas gramaticales asociadas con frases	• Uso de vocabulario general

WIDA Spanish Language Development Standards (2012) have created a chart called Performance Definitions, in which they define language performance in Spanish across five different levels, using the criteria of linguistic complexity, forms and conventions, and vocabulary usage (WIDA SLD Standards, 2012). According to the WIDA Spanish Language Development Standards (2012), emerging bilinguals at emergent level are able to express isolated ideas and use simple phrases or sentences. They are able to use repetitive grammatical forms and conventions that use patterns related to a topic and use of common or everyday words. The sample above shows evidence of copied text, compared to the text the teacher shared with students on the board. The original text was supplied by the student but its complexity was also at an emerging level in Spanish. Below is a table analyzing the language in the sample.

Table 7. Analysis of language in student sample using WIDA's SLD Performance Definitions

Text	Source	Analysis of original text
Primero tuvimos que mirar si el problema era de perímetro ó área. (sic) First we had to see if the problem was about perimeter or area	Copied	
Después tuvimos que multiplical 10 por 8 porque era logitud por ancho.(sic) Then, we had to multiply 10 by 8 because it was long[18] by width.	Copied	
Que mi resultado es 80 metros. That my answer is 80 meters.	Copied	Fragment
Siguiente yo divide 80/16 porque yo sabe que las bolsas cubre 16m^2 (sic) Next I divides 80/16 because I knows that the bags cover 16 sq. m. (sic)	Original	As student attempts to write complete sentence, he is unable to apply the conventional use of punctuation, such as a comma after "Siguiente." The grammatical forms of verbs do not agree with the subject in person (uses third person instead of first person). New vocabulary are cognates and general language.
Al final, yo multiple 16X5=80 y agare 80 y por eso mi respuesta es 5 bolsas. (sic) At the end I multiple 16 X 5 = 80 and I took 80 and that is why my answer is 5 bags. (sic)	Original	Student is able to repeat same grammatical construction attempting past tense, but again, uses the wrong person (third person instead of first person). Only new vocabulary is general language. All other vocabulary was in the problem statement.

[18] I kept a similar equivalent to the language in the translation of this phrase to show the type of error in the text.

According to WIDA Spanish Language Development Standards (2012) shown previously for the emerging level, the use of repetitive grammatical constructions and general vocabulary corresponds to level 2. While there were a couple of ideas expressed, they were copied and included simple sentences, also corresponding to level 2.

The mental processes used in producing the sample text above were not complex. The emerging bilingual student used the model from the shared writing activity in her work as a recipe, following the set language vocabulary, forms, and patterns. This task, according to Webb's depth of knowledge model (2007) is typical of a depth of knowledge level 1, reflective of the complexity of the task, not of its difficulty.

Again, this student was one who went beyond what her classmates did. Most of her peers did not attempt any original text and copied most of the text from the board, including some of the same typos that the teacher included in her model. No student attempted a correction to typos or errors in language; in other words, the information was copied without students looking at the language critically.

This is an example of how the outcome and products of the Bridge, which was meant to be a space for emerging bilinguals to focus on meta-linguistic and meta-cognitive skills and dive into tasks of higher cognitive demand, were not achieved. From a cognitive perspective, Ms. Martínez did not engage her students in metalinguistic conversations, but started the class looking for definitions. Asking questions that went beyond the similarities in the words and focusing on the use of the language could have deepened students' thinking about the two languages that belong to their linguistic repertoire. Moreover, there was no awareness of the

use of translanguaging, as the students were solving the problem, as a tool that could be used to enhance working memory.

From a sociocultural perspective, the lesson was not designed to maximize interaction or to make it meaningful. There was interaction between the group and the teacher, but student-student interaction was a choice and the task did not require interaction to be executed. Furthermore, the lesson was teacher directed, maintaining the differential status between the teacher and her students. Emergent bilinguals were not engaged in strategic conversations about language either. Providing her students with critical questions about language use or prompts in the problem that needed language interactions could have taken advantage of the dynamic of language, but their absence limited the engagement of emerging bilinguals in deep conversations or a focus on language.

An assumption in this model is that students already know the mathematical concepts before starting the Bridge, so that they would turn their attention to language use. However, it was not evident at the beginning of class that everyone could answer the questions without the models provided by Ms. Martínez. Further, low linguistic engagement, such as copying, could mean that either the task itself did not elicit creative uses of language or that emerging bilinguals did not feel comfortable going beyond the language in the shared writing. Since these students had been in a two-way immersion program since Kindergarten, either alternative is of concern. However, since all tests were conducted in English in this school, there was no evidence for emerging bilinguals' language proficiency in Spanish or for their use of translanguaging to share their deeper knowledge.

Translanguaging as pedagogy

While research indicates extraordinary potential in leveraging emerging bilinguals' translanguaging practices as tools to mediate learning, evidence from this research indicates that in doing so, educators must take into consideration several factors in translating theory to practice. From analysis of the observations, interviews and emerging bilingual work samples described above, I would like to highlight the following. Translanguaging pedagogical approaches, unlike the Bridge, should

1. take place during instruction to provide students opportunities to use it as a tool for learning
2. incorporate translanguaging in meaningful and relevant tasks
3. select tasks that require deeper levels of knowledge and challenging cognitive demands
4. balance language power and status by strategic language allocation, for example, using the language with lower status as the language of instruction and the language of higher status as the language of the Bridge

Next, I will unpack each of these points.

1. *Translanguaging should take place during instruction to provide students opportunities to use it as a tool for learning*

Even though Ms. Martínez elicited prior knowledge by engaging her emerging bilinguals in a conversation about the unit they had just finished with Ms. Lucy, her emerging bilinguals did not seem too comfortable with the content. Evidence of this was that most emerging

bilinguals could not verbalize when to use area or when to use perimeter. Moreover, most emerging bilinguals did not include any representation of the relationship between the data in the problems; all they included were the calculations performed to get the answer. While a representation was not explicitly required by Ms. Martínez, research has shown that representation of relational prepositions is a key step in solving word problems (Dixon & Bangert, 2005, Lewis & Mayer, 1987; Suh & Moyer, 2007; Xin, 2003, 2004). Finally, the fact that Ms. Martínez spent about half of the class re-teaching the two concepts in small groups also added to the evidence that emerging bilinguals in her class had not learned enough of the concepts of perimeter and area to feel comfortable with the task. Beeman and Urow (2013) propose the Bridge as a time to engage in contrastive analysis of English and Spanish, but by engaging in re-teaching the content, there was little time for emerging bilinguals to really engage in dialogue related to the language. Instead, I propose using translanguaging as a tool during instruction of the content in order to provide meaningful and relevant uses for translanguaging instead of an artificial use for it. Using translanguaging during learning also affords authentic opportunities to talk about language use in learning that arise from real problem solving while negotiating meaning and solving challenging problems. Finally, while teachers can plan for thoughtful purposes for use of language, they cannot predict how emerging bilinguals will use language. Therefore, it is important to remain flexible and attentive to opportunities to leverage translanguaging use, rather than trying to limit it within a structure.

2. *Incorporate translanguaging in meaningful and relevant tasks*

In past decades, many researchers in mathematics education have emphasized the roles of contexts, environments, or settings in learning. Some theorists (Brousseau, 1997; Brousseau, Brousseau, & Warfield, 2001; Cobb & Bowers, 1999; Kieran, 2001; Lave & Wenger, 1990) have argued that learning not only involves acquiring abstract knowledge by personal cognitive activities, but also is situated or embedded in activity, context, culture, and social relationships (thus it is both a cognitive and sociocultural activity). During mathematics instruction, personal cognitive activities include the implementation of a rigorous curriculum (Brousseau, 1997; Brousseau, Brousseau, & Warfield, 2001). For emergent bilinguals, I propose that the curriculum should also challenge them to engage using their complete linguistic system, and not just parts of it at specific times. Attending to context and culture involves teachers' active commitment to students (Cobb & Bowers, 1999; Kieran, 2001). Such commitment, in my opinion, should not be to particular programs or approaches that are inflexible to the needs of emerging bilinguals or that neglect or limit their unique assets.

Mathematical learning also requires a commitment of a collective enterprise or cooperative learning, and instructional scaffolding—practices that align with culturally responsive practice (Lave & Wenger, 1990). These practices have been shown to influence the tendency of minority students to take more mathematics and higher levels of mathematics than their counterparts in other schools as found in other research. However, in her research, Gutierrez (2000) found that it was not only challenging mathematics curriculum that made a difference, but also the inclusion of resources that relate to emerging bilinguals' interests. In this study, the task provided was not meaningful or relevant. Finding out how long a border for

a bulletin board has to be was not an interesting topic or one that tied to emerging bilinguals' interests or lives. The goal of the activity for them was finishing the work and finding the right answer. Translanguaging, while acceptable in this space, was not enough of a connection for emerging bilinguals to find the task meaningful and relevant, and thus they did not engage in using language together to negotiate it.

3. *Select tasks that require deeper levels of knowledge and challenging cognitive demands*

The development of mathematical thinking, such as problem-solving strategies, common understandings and misconceptions, and number choices and problem structures that support appropriate levels of cognitive demand, has been identified as a key factor in effective mathematics instruction (Carpenter, Franke, Jacobs, Fennema, & Empson, 1998; Stein, Smith, Henningsen, & Silver, 2000). Mathematics teachers approach the development of mathematical thinking in different ways, including through the selection and implementation of highly cognitively demand tasks (i.e., tasks that require complex thinking and reasoning strategies such as conjecturing, justifying, and interpreting) and the use of questions to elicit, connect to, and support students' strategies and reasoning (Sleep & Boerst, 2012; Stein et al., 2000).

It could be argued that the cognitive demand of each task provided to Ms. Martínez' emerging bilinguals was challenging. From the sample handout (Figure 4), one can see that the problems required emerging bilinguals to comprehend the text, extract the relevant information, and then apply the appropriate strategy to solve the problem. Using Webb's depth of knowledge framework (1997), this type of problem is at level 3 because it requires short-term strategic thinking, that is, emerging bilinguals engage in higher order thinking processes for a short while in order to analyze and evaluate the task in order to solve the

problems. The key marker for assigning this task a level of three is Ms. Martínez' request to emerging bilinguals to state their reasoning. However, since there were only two tasks, most emerging bilinguals either worked through one of them guided by the teacher or heard the strategy to follow from her (e.g., area) and then just guessed that the other task would be solved using the other strategy (e.g., perimeter).

Another opportunity to engage in higher order thinking during the Bridge may have happened through the contrastive analysis of Spanish and English. When emerging bilinguals are provided with word equivalents in one language of unfamiliar words in a different one, it has been found that the cognitive processing taking place increases (Macaro, 2009). Translanguaging practices also promote metacognitive awareness when emerging bilinguals are engaged in strategies for interacting with both languages across various contexts and allowed to manipulate not only the language, but also the contexts themselves and their interactions with texts (Canagarajah, 2011). However, Canagarajah (2011) suggests that teaching practices should be developed from the strategies that emerging bilinguals use, bring from home or from their communities' funds of knowledge (Gonzalez, Moll & Amanti, 2005), instead of imposing someone else's views of how translanguaging works. Thus, applying a framework as a one-size-fits-all pedagogy, such as the Bridge, would not fit into an emerging bilingual-centered and context-dependent approach.

While the Bridge may not provide the flexibility that some researchers believe translanguaging needs to flourish, it does provide spaces to question emerging bilinguals about their language choices, to push them to think critically about diverse options and to assess the effectiveness of their choices. These types of activities promote metalinguistic awareness,

which has shown to be associated with cognitive flexibility, mental abilities and divergent thinking (Bialystok, 1986; Díaz & Klinger, 1991; Landry, 1974; Lambert, Tucker and d'Anglejan, 1973; Peal & Lambert, 1962; Yelland, Pollard and Mercuri, 1993). However, at this point, metalinguistic awareness has only been associated with movement across languages as different linguistic systems, which would align with the concept of code switching, which also sees language movement as something that occurs across distinct language systems, and not translanguaging, which has the premise of movement across language varieties taking place within a single integrated linguistic system.

Unfortunately, there was no evidence in the data collected in Ms. Martínez' mathematics class during the Bridge that any of this type of questioning or activity took place. Both Ms. Martínez and Ms. Lucy reported the lack of metalinguistic awareness and translanguaging being a big challenge in their teaching. They noticed their emerging bilinguals would use translanguaging practices during science and social studies, which were taught in Spanish, but rarely saw translanguaging occur in classes, like mathematics, which were taught in English.

> *When I did science and social studies, they would say they were working on a project. They would, then, go in between the two languages when they were working and of course, I allow them to speak whatever language they want when they're working… but I don't see that in math. They don't collaborate in Spanish probably because they've never been taught in Spanish in math and for language arts… it just depends.* (interview, 1/30/2014)

As Ms. Lucy suggested, emerging bilinguals at this level may have everyday language in Spanish that they are able to use to communicate in social contexts; however, they may still be acquiring the more abstract Discourse of content areas, such as mathematics and science. In science and social studies, which were taught in Spanish, students did not stay in Spanish because it was the language of instruction, but instead, during work, they would revert to English instead of staying in the language of instruction, like they did in mathematics.

While both Ms. Lucy and Ms. Martínez encouraged their emerging bilinguals to use any language they wanted or in which they felt most comfortable, most chose to use English in social situations, during mathematics and in language arts. Ms. Lucy admitted that her students did not use Spanish during the Bridge because instruction was in English and maybe the Bridge did not provide enough language for them to use Spanish. However, the social situations also took place in English. She pointed out that another cause for this was the power differential between Spanish and English.

4. *balance language power and status by strategic language allocation, for example, using the language with lower status as the language of instruction and the language of higher status as the language of the Bridge*

The ideologies and structures of power differentials between languages have been theorized and researched through the lenses of linguistic imperialism (Phillipson, 1988; Skutnabb-Kangas, 1988), language policy (Donahue, 1995,

Schirling-Billings, Ayala & Contreras, 2000) and language education (Cummins, 2001; García, 2007; Valdes, 1997). Language status has been associated with emerging bilinguals' academic delays, dropout rates, negative peer relations, and discrimination (Cummins, 1994; National Survey of Latinos, 2002; Padilla and Perez, 2003; Shields & Behrman, 2004; Suarez Orozco & Suarez Orozco, 2001). Further, learning and speaking English can be viewed as one of the ways towards life success in the US (Behnke, Taylor & Parra-Cardona, 2008; Orellana et al., 2000). Because mathematics in Ms. Lucy and Ms. Martínez's class was taught in English, the Bridge took place in Spanish. All of the accountability tests, including state and benchmark tests, were offered in English (interview with principal, 5/7/2014). Therefore, the fact that students learned mathematics in English and that Spanish was an add-on sent the message that English was the main language for learning. Emerging bilinguals' preferential use of English, even for those emerging bilinguals who identified Spanish as their home language, occurred during social contexts and during free time in classes that were taught in Spanish (interview with Ms. Lucy and Ms. Martínez, 01/30/2014)

Allocating language in TWI programs, therefore, should take into account language status to ensure equity in the use of both languages. For instance, having to learn the mathematical content in Spanish would reinforce the importance of Spanish as a language of instruction and emerging bilinguals would still be able to use the Bridge as a way to process learning at the end of the unit. This way, emerging bilinguals who identified Spanish as their home language could use their

stronger language to engage in mathematical thinking and learning. Emerging bilinguals who identified English as their home language, on the other hand, would use Spanish in meaningful ways to solve challenging math problems.

School perspectives on bilingualism

Newberry District's message to the families of emerging bilinguals and the staff at their schools has always been supportive of bilingualism. However, the ideology behind what it means to be bilingual has shifted over time. When the TWI program began in 2007, a program with strict language separation policies was implemented. As the district's program has matured and Ms. Palmetto, the program's director at district level, has provided countless hours of professional learning opportunities for staff and meetings with parents in the program, the idea of strategic language separation along with supportive bridging strategies supplanted the policy of strict language separation. However, reminiscence of earlier language policies still permeates through the classrooms:

> *Based on what I was taught, the bridging should not really occur here at all (*referring to the English classroom where math instruction takes place*)...obviously, if they ask me, we will talk about…you know…about…what would you refer to this in Spanish, but for the most part I'm teaching strictly in English when I am doing the teaching. Now, I will many times speak to them in Spanish, but they are so funny because they are in here and they're like Ms. Lucy, this is the English classroom,*

> *and I say, yes, I know but it's okay to speak in Spanish. I am not teaching you right now, I'm talking to you and they're like, but it's English and I say, but yes, but I can, we can talk in Spanish, that's ok!* (Ms. Lucy, interview, 1/30/2014)

Some students still feel their languages cannot mix and their teachers are bound by physical spaces. Further, the teachers themselves believe and send the message that languages should be separated during instruction and that translanguaging is okay during non-instructional conversations. However, even during Spanish time and social contexts, students spoke exclusively in English.

Summary

Translanguaging practices have great potential to shift and transform educational practices for emerging bilinguals. However, educational systems must take into consideration their context and the personal, family and group histories of emerging bilinguals when adopting instructional frameworks. In this study, for example, Ms. Martínez' personal history of language marginalization ultimately maintained the status quo of the language of power (English) in education, as it led her to not respond critically to the use of English during Spanish time.

Several factors impacting the effectiveness of Teaching for Biliteracy at a systems level were identified. First, the professional learning opportunities and resources related to the framework were not available to all teachers, only to teachers in the TWI program. Secondly,

many of the professional development activities included attendance at workshops, but there were limited resources for job-embedded, ongoing professional learning. Lastly, with a limited number of staff knowledgeable about the framework, and limited resources and time for planning, it was hard to establish professional learning communities among the bilingual educators in the school.

While no one-size-fits-all instructional approaches really fit all instructional programs and contexts, this research found some factors that should be considered as educators make decisions to include translanguaging without the use of frameworks that aim to operationalize translanguaging, such as the Teaching for Biliteracy framework. These considerations include (1) promote classroom ecologies in which translanguaging takes place during instruction to provide students opportunities to use it as a tool for learning, (2) incorporate translanguaging in meaningful and relevant tasks, (3) select tasks that require deeper levels of knowledge and challenging cognitive demands, and (4) balance language power and status by supporting an additive perspective on bilingualism through equitable availability of resources, visibility of both languages throughout the environment in which students learn and play, and by avoiding giving preference to large-scale assessments over meaningful time for exploring and playing with language.

In summary, translanguaging can be viewed as a bridge, but not across languages; it is instead a way to bring emerging bilinguals' unique linguistic assets, like translanguaging, into the heart of learning. Translanguaging, viewed as a practice in which emerging bilinguals use the languages across their linguistic repertoire as an integrated system, requires an integrated view of instruction. Professional learning for educators is needed in this area, but not in the

form of training on specific programmatic structures. Professional learning should focus, in my opinion, on learning to identify spaces where translanguaging occurs so that it can be nurtured and on reflecting on language use as a tool to mediate learning.

CHAPTER 6: PEDAGOGIA CON CARIÑO

> "*La maestra Icela has been able to get out of those students things NO ONE can get out of them. It's incredible. […] And I think it's because she is not trying to fit them into some other box.*"
>
> *-Ms. Dewey, Principal of Hixton Elementary*

Introduction

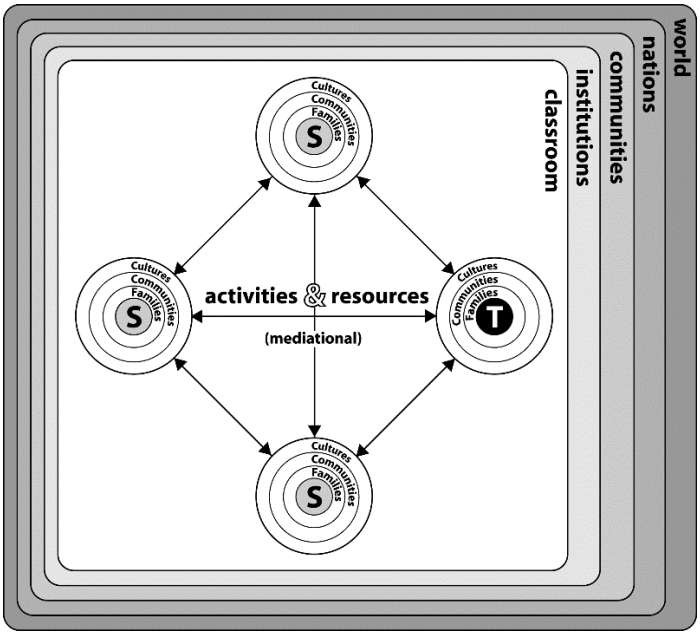
In earlier chapters, I discussed literature that claims that translanguaging can be a powerful tool that supports mathematical thinking. However, I also discussed some of the consequences of its use in inflexible program models or within instruction absent of supporting design of activities that are challenging and that engage emerging bilinguals in co-construction of knowledge and meaning-making. In this chapter, I will analyze and discuss the various elements in the classroom that constitute the ecology of *la maestra Icela*'s classroom, in which, in my opinion and that of Ms. Dewey, the school principal, learning and translanguaging was meaningful and fun. My goal in using ecology as a framework is to identify the elements that work in tandem to mediate learning in this classroom.

Ecological frameworks as tools to study relationships between participants within a system have been used in the fields of psychology and linguistics (Bronfenbrenner, 1979, 1993; Hornberger, 2002; van Lier, 2004). Ecological frameworks are compatible with sociocultural theories of learning and language development because they provide an opportunity to examine "complex […] systems that include multiple, complex and often interdependent components and characteristics" (Hawkins, 2004, p. 15). In the case of bilingual classrooms, emerging bilinguals, as Hawkins points out, must negotiate all of these components socially and

academically in order to successfully participate. I believe that in settings where multiple languages interact, such as the bilingual classrooms in Hixton, participation of emerging bilinguals also depends on linguistic negotiation. Further, I believe that in this particular classroom, the glue that holds all the pieces of the framework together is *cariño*, which translated into English is caring with love, or loving with care.

Figure 8 depicts the ecological framework I will be using in this chapter. This graphic shows each independent student as a complex system, who brings with him or herself ways of socializing, and of knowing and of using language that have been learned from his or her family, community and culture. Learning does not only involve each individual's social, academic and linguistic resources, but those of other participants, including other students, the teacher and other adults in the classroom, if applicable. Moreover, the classroom itself is not a vacuum in space, but instead, it is a space within the system of the institution in a particular community, nation and the world. Ecologically, one needs to explore how each of these components interacts with each of the others and on the system.

Figure 8. Ecology framework (Hawkins, 2004)



As I use this framework to study *la maestra Icela*'s classroom, I will focus on resources and activities that were present during the time I observed her classroom as well as those that Ms. Dewey, the principal, shared with me during her interview.

Pedagogía con cariño

There is no literal translation for the word cariño from Spanish to English, although some have translated it as love or caring. In Spanish, cariño is the type of love parents have for their children or siblings have for each other. It is also the respectful love one has for one's teacher. Cariño is also what I observed in la maestra Icela's classroom, not only from the students, but also from her. Her class had been part of the transitional program but this year, in 4th grade, their program had shifted to a developmental bilingual program, therefore, all of her students were emergent bilinguals who identified Spanish as their home language, but who

spoke Spanish at varying levels of proficiency. In my review of literature on this approach, I found research on caring pedagogy, which I will review in this chapter and use to analyze my observations.

Learning, from a sociocultural perspective, takes place through social interaction (Vygotsky, 1989), which means that students' abilities to interact and relate to one another are key elements in learning. Some researchers believe that students' social development is part of a teacher's responsibilities (Jansen & Bartell, 2013; Noddings, 2005). From Jansen & Bartell's perspective (2013), caring discourse and interaction are (or should be) modeled by the teacher, providing (as a result of the modeling) opportunities for students, "… to learn to enact and receive care in a psychosocially healthy manner." (p. 34). Research on caring as an approach to teaching has shown that students' efforts increase when they perceive that their teachers care for them (Muller, 2001; Stipek, 2006). The relationship between educators and students of color has been argued to be essential to student engagement (Anthrop-González & De Jesús, 2006; Dance, 2002; Katz, 1999; Noddings, 1984, 1992; Thompson, 1998; Valenzuela, 1999). Further, it has been shown that when at-risk students perceive that their teachers care for them, they perform better in mathematics compared to at-risk students who do not perceive that their teachers care for them (Muller, 2001). Emerging bilinguals in la maestra Icela's class, as a matter of fact, outperformed students in other 4th grade classrooms, including monolingual English and gifted students, and those in maintenance bilingual and TWI programs, in interim assessments throughout the school year (interview with school principal, May 7, 2013).

In the literature on caring in education, two types of care are addressed: interpersonal care and academic care. Interpersonal care refers to the teacher's act of taking the student's perspective, understanding and accepting the student's feelings and acknowledging the student's experiences (Mayerhoff, 1971; Noddings, 1984, 1992). *La maestra Icela* showed great interpersonal care with her students. She demonstrated it by getting to know her students and their families and attending community events. She often shared comments about how her students would feel or respond to certain activities based on her knowledge about them and their families. She knew, for example, that Graciela, one of her students, would be upset about not handing out prizes, since she was a single child in her family and often felt not enough attention was being paid to her (informal interview with teacher, May 10). With this in mind, *la maestra Icela* talked to her ahead of time. She also knew that Victor, another student in her class, had a great voice, but would be very nervous about performing in public in the upcoming talent show, so she made space in the day for him to sing in front of the class every day leading up to the talent show (informal interview, May 29, field notes, May 29-May 31).

Academic care, the other type of care addressed in research, refers to the care that addresses "technical aspects" of teaching and learning, such as the co-creation of a "shared intellectual space" where teachers work to share with students their understanding of a concept while simultaneously working to understand students' understanding(s) of a concept (Goldstein, 1999). During instruction, la maestra Icela often varied the way in which she introduced or explained new information, and asked students to paraphrase or explain in a different way solutions to math problems. She was always aware that her students had various learning styles and experiences and made sure she approached concepts in various ways and

varied contexts. In the following exchange, five students were each solving a different problem on the blackboard while *la maestra Icela* was coaching them:

Manuel: *¿Así está bien?*

Is this right like this?

*La maestra Icela: Tú dime. ¿Qué hiciste?...[*pointing to Manuel's calculations*] Ah, ya veo…, ¿por qué decidiste sumarlos todos?*

You tell me. What did you do?...[pointing to Manuel's calculations] Oh, I see…why did you decide to add them all together?

Manuel: Cuz…*Porque quiero ver cuánto mide todo alrededor*…

Cuz…I want to see how it measures all around…

La maestra Icela: Y entonces, ¿cómo sabes si está bien? De que otra manera podrías haberlo hecho? Piensa en todas las maneras que el grupo encontró ayer y enséñame otra manera…sólo para checar…

So then, how do you know if it is correct? What other way could you have solved it? Think about all the ways that the group found yesterday and show me a different way…just to check…

La maestra Icela: A ver, Julia, tú ¿qué hiciste?

Let's see, Julia, what did you do?

Julia: I just multiplied because all sides are three (3)

La maestra Icela: Ah, you multiplied, *tú multiplicaste*

Julia: Yeah, *multipliqué*

Yeah, I multiplied

In the exchange above, Manuel finished his work before anyone else and wanted confirmation that he had done it well. *La maestra Icela* asked him about his rationale for the strategy he used, which she did not ask all students. Then, she asked him to think about other ways to solve the problem as a way to check his problem. She took the opportunity to extend his repertoire of strategies and to have him explain himself in Spanish. Julia does not feel as comfortable with Spanish as Manuel does. Even though both of her parents are bilingual, she prefers to communicate in English. By restating her strategy in Spanish, *la maestra Icela* made sure she offered an opportunity for Julia to use Spanish to restate her answer, focusing more on the language than on the math itself. Based on the different experiences Manuel and Julia had and their knowledge of language and mathematics, she addresses each of their responses in different ways.

Researcher: *¿Por qué le habló a uno en español y al otro en inglés?*

Why did you talk in Spanish to one and in English to the other one?

La maestra Icela: *Bueno, es que, pues yo sé que Manuel habla bien el español. Sé que sus papás le hablan en español todo el tiempo, pero, yo, pues yo trato de que se explique, ¿me entiendes? Que hable más en español*

Well, it's because, well, I know Manuel speaks Spanish well. I know his parents talk to him in Spanish, but, I, well, I try to help him explain, do you understand? To make him talk more in Spanish.

Researcher*: ¿Y Julia?*

And Julia?

La maestra Icela: *Ah, pues Julia no habla mucho español. Al principio, le hablaba en inglés, pero ahora se lo digo en español y ella lo entiende. Si te fijaste ella responde en inglés, pero yo repita lo que dijo y lo digo luego en español, para que ella lo repita y luego ya le pido que me lo diga en español*.

Ah, well, Julia does not speak much Spanish. At the beginning, I would talk to her in English, but now I talk to her in Spanish. If you noticed, she answers in English, but I repeat what she says and then say it in Spanish, so she can repeat it and then I ask her to talk to me in Spanish.

La maestra Icela's ability to match her strategy to students' needs and experiences is an example of her academic care.

Students, as discussed in research literature, have reported that caring teachers usually provide interpersonal and academic care specific to individual students, rather than the group

of students (Jansen & Bartell, 2013). This was true of *la maestra Icela*, too. Other research found that teachers who were perceived as caring by their students were academically helpful and held and communicated high expectations for behavior and achievement (Alder, 2002). Finally, Garza (2009) found that caring teachers showed a personal interest in students' emotional well-being in and out of the classroom, were available to students, provided scaffolding to students, and gave students chances to succeed. During the time in which observations were recorded, la maestra Icela often visited the playground during recess (Field notes, 5/8, 5/10, 5/13, 5/17, 5/24, 5/29, 5/31) and talked to parents (interview, 5/8/2014) to find out in which activities her students were engaged outside of the classroom and the school, including free time at school. *La maestra Icela* was also often invited to birthday parties and other family celebrations (interview, 05/8/2014).

Caring instruction has also been identified by students as fun; caring teachers were described by students as having a sense of humor and providing help with academic work (Hayes, Ryan & Zseller, 1994). Children in la maestra Icela's class were always laughing and, while she often used the formal form in Spanish (i.e., usted) when talking to individual students, she often joked with them.

While much of the literature related to caring instruction did not focus on particular content areas, there is some research that has centered specifically on mathematics instruction. This research, focused on academic care, highlights the relevance of knowing and understanding students' mathematical thinking. It also emphasizes building upon students' mathematical thinking (Averill & Clark, 2006; Hackenberg, 2005, 2010). In these studies, teachers put students' mathematical thinking at the center of the cognitive work in their

classrooms, and were interested in their students' feelings of stimulation, or excitement, and depletion, or taxation, while working on mathematics. The most prominent examples of this in my study took place during the last week of observation, as students were preparing for the state content tests. *La maestra Icela* would give additional breaks to her students to get outside and move; she would bring snacks; and she would make sure all of her students had positive experiences in preparation for the challenging cognitive work she knew they would have throughout the day. She often complained about the emotional drain students experienced during this time of the year and sought ways to help her students manage their time and energy [Icela, interview, 5/8/2013; informal conversation, 5/31/13).

What was missing in the literature of pedagogy of caring within the content of mathematics that I reviewed was the attention to the interpersonal care as it related to students' cultural and linguistic repertoires. I would like to draw from the literature related to Funds of Knowledge (Gonzalez, Moll & Amanti, 2005) to bring attention to specific aspects of the interpersonal care of emerging bilinguals in mathematics instruction. As stated earlier, understanding and accepting the student's feelings and acknowledging the student's experiences (Mayerhoff, 1971; Noddings, 1984, 1992) has also been shown to have an effect on students' perceptions of their teachers as caring educators, thus increasing students' effort. Thus it would seem that tapping into students' funds of knowledge as a way of supporting students' learning, as highlighted in culturally responsive pedagogies (Aguirre, 2009; Leonard et al., 2010), would provide a pathway towards acknowledging students' experiences. Research has indicated that underrepresented groups benefit from instruction that draws upon their cultural, linguistic, and community-based knowledge (Ladson-Billings, 1994, 1995; Lipka et al.,

2005). The rationale is that such approaches help teachers to understand how the knowledge, skills, and experiences found in children's homes and communities can support their mathematical learning (Civil, 2007; Foote, 2009; González, Moll, & Amanti, 2005). I believe that conceptualizing Funds of Knowledge as a tool to mediate interpersonal care can help explain the connection between *la maestra* Icela and her students, and their effective community of learners.

La maestra Icela was a favorite at Hixton, in large part because of her interpersonal care for students. Even children who had never been her students would stop by to talk to her. The first day I met her, she was talking to a fifth grader who was having a hard time staying on task in his class and had ventured into the hallways. After chatting with him, she got him back on track and sent him back to his class. This student was not from a Latino background and did not speak Spanish; he had never been her student. In 4th grade, though, she connected with him when she saw him outside of music, throwing a temper tantrum. Since then, every time he gets in trouble, he comes to find her and uses her classroom to cool down until he is ready to go back to his class.

Another example of how she makes personal connections with each child in class is through using their names constantly. When she works with her students as a large group or even giving directions, she uses her students' first names constantly, as if talking to each child directly:

Maestra Icela: Tienen todas las palabras que necesitan, ¿verdad, ***Lisbeth***[19]*? La siguiente, ¿cómo dice la siguiente,* ***Roberto****? Cincuentamil… ¿****Aldo****? Igualmente, tienen todas las palabras que necesitan, ¿verdad* ***Salvador****? A ver ¿quién puede escribirla más rápido, ustedes o yo?*

Maestra Icela: You have all the words you need, right **Lisbeth**? The next, one, what does it say, **Roberto**? Fifty thousand… **Aldo**? In the same way, this one has all the words that are needed, right **Salvador**? Let's see who can write it faster, you or me?

In this example, *la maestra* Icela was giving directions for a problem on which students were going to work in groups. Everyone had the same problem in their math textbooks, which they had open on their desks and were copying into their notebook to solve. As she highlighted relevant information in the first problem, she conversed casually with students, including using the names of various students individually. Although in this example she called on three boys and one girl, typically, *la maestra* Icela would call boys and girls in a balanced manner. The reason I chose this example, though, was to highlight how, in giving directions for one single problem, she called on four different students by name. This was not a way to get students' attention because they were distracted- all students were paying attention during this particular interaction and were on task- but instead, it appeared to be an intentional strategy she used to make sure each student felt addressed and included during instruction.

[19] Bold font is only to highlight how often la maestra Icela used first names while working in a large group format.

At the end of this particular interaction, *la maestra Icela* challenges her students to see who finishes copying the problem first: she on the whiteboard or the students in their notebooks. She often engages her students in these types of playful interactions or jokes with them, but in a respectful manner. During my observations, even though she often challenged them to do better than she did, I never saw or heard her ask her students to compete with each other. This resulted in students cheering each other towards a common goal and it seemed to create a sense of community, rather than individual competition or individual success. While early explanatory models of Latino students' poor academic performance have focused on internal characteristics of students, such as bilingualism, negative self-concept, negative cultural attitudes toward education, and low intelligence and apathy, research has shown little support for those explanations (Arreaga-Mayer & Greenwood, 1986; Hall, 1984; Madrid, Canas & Watson, 2003; Valencia, Henderson & Rankin, 1981). Instead, more recently researchers suggest looking at the external or environmental correlates of academic performance, including the way in which teachers interact with students and design their instruction. Thus research on emerging bilinguals' school achievement is moving away from cognitivist perspectives towards sociocultural ones, locating learning in specific environments, contexts and relationships. Literature focusing on environmental factors has shown that Hispanic bilingual children, in particular, tend to be more cooperative and affiliative when compared to White, non-Hispanic children, who tend to be more competitive and individualistic (Kagan, 1980). Literature has long pointed out the community-bent of Latino students, specifically those who are Mexican American (Greenwood et al., 2001;

Holtzman, Díaz-Guerrero & Schwartz, 1975; Kagan, 1980; Kagan and Madsen, 1971; Madrid, Canas & Ortega-Medina, 2007; Madrid et al., 2003; Reese et al., 1995; Sanders, Scholz & Kagan, 1976), making collaborative strategies more effective in schools than traditional individualistic approaches.

Pedagogía con cariño and translanguaging

While the research mentioned found that teaching approaches that were team-based were more effective than teacher-led teaching approaches, some research also found that when the team-based approaches were culturally sensitive, they further enhanced the positive academic gains of students from diverse backgrounds (Greenwood et al., 2001; Madrid et al, 2007). I believe that linguistically sensitive approaches also impact student engagement and learning in positive ways. *La maestra* Icela had the same linguistic and cultural background as many of her students, and she drew on it during her teaching. For example, she would use English, Spanish and translanguaging in similar ways as her students:

La maestra Icela: *Este problema está en inglés, ¿verdad Julia? Ayúdame a leerlo, en voz alta.*

This problem is in English, right Julia? Help me read it, aloud.

Julia: Lisbeth's mom is making tamales for her sister's quinceañera. To cover each tamal, she needs two corn husks. She needs to make 500 tamales. How much money will she need to spend on corn husks if each corn husk is 10 cents?

La maestra Icela: *Gracias, Julia. A ver, primero voy a pensar en lo que me están pidiendo. Quieren sab*er how much money, *¿verdad Julia? Para saber cuánto va a gastar, tengo que saber cuánto necesita. ¿verdad Manuel? Si va a hacer 500 tamales y necesita* 2 corn husks, *2 hojas de maíz por tamal*…

Thanks, Julia, let's see. First, I need to think about what they are asking me. They want to know how much money, right Julia? In order to know how much she has to spend, I need to know how many she needs, right Manuel? If she is going to do 500 tamales y she needs 2 corn husks, 2 corn husks per tamal…

[various children try responding...]

La maestra Icela: *Ya oí la respuesta por ahí. Si cada uno lleva dos, entonces 500 necesitan? 250? No! Eso, lo escuché, 1000, ¿verdad?*

I already heard the answer around there. If each takes two, then 500 are needed? 250? No! That's it, I heard it, 1000, right?

In the exchange between *la maestra Icela* and her students, even though the problem was in English, *la maestra* Icela used Spanish while thinking about the solution of a problem out loud. In addition to switching languages, the problem she chose was related to an event and a food that students in her class were familiar with, *quinceañeras* and tamales. As a matter of fact, Lisbeth was an actual student in her class and her sister had just had a *quinceañera*.

Lisbeth smiled as Julia read the problem because she saw the connection with her own family history. The emerging bilinguals in the class also shared a similar Mexican heritage where both *quinceañeras* and *tamales* are part of their cultural and linguistic repertoires. By choosing to have the problem in English, but with key words and concepts in Spanish, and then solving it in Spanish, she encouraged her students to use their linguistic resources in their learning. Usually, math was taught in Spanish during the times I observed her class, but as she mentioned during her interview, "*enseño como ellos lo aprenden*" (I teach the way they learn) (5/8/2013). By choosing a culturally familiar event and food, she showed her emerging bilinguals that math was also part of their everyday life, including their families' cultural events. This made emerging bilinguals more comfortable in using their linguistic and cultural resources for learning. It also modeled reflection on purposeful use of language, and most importantly, they saw evidence of the use of these resources as part of the formal body of knowledge in their classroom, and in their academic life. It is important to note that she did not include culturally relevant contexts because she was from the same ethnic background of her students, because other teachers of the same background of the students did not follow this practice. Instead, it was the fact that she did, which could be a choice a teacher from any ethnic background could make. She combined linguistic and cultural resources with humor to teach everything from spelling to key words in math problems:

> *Maestra Icela: Realmente podemos aprender mucho solamente de ver una palabra, la podemos quebrar, por ejemplo, una de nuestras palabras favoritas, together*, *to-get-her…Together es muy difícil para ellos saberla deletrear […] y ellos se acuerdan de algo gracioso que dijimos*

> *Maestra Icela:* We can really learn a lot from just looking at a word. We can break it up. For example, one of our favorite words, together, to-get-her…Together is very difficult for them to spell […] and they will remember it as something funny we said

In the example above, *la maestra* Icela is explaining how she talks to her students about language and how she helps them to think about it. In this particular instance, she was chatting with them in Spanish, about English words, like *together*, and she was recounting how she and her students shared different ways to remember meanings or spellings or words across languages, but moved across them with ease, as part of an integrated system of communication. This is an example of how she used multiple linguistic repertoires to reflect on language. I believe these types of activities helped her emerging bilinguals to develop metalinguistic awareness through the use of their unique language system consisting of various linguistic repertoires. In other words, she was modeling how to use the linguistic resources available in her system for learning and for negotiating meaning of unknown words, which could help her students function and be successful in school (Delgado Gaitán, 1990, 1992, 2004; Suárez Orozco & Suárez Orozco, 1995; Trueba, 1988, 1991).

La maestra Icela moved from Mexico to Texas when she was 12 years old. Ms. Dewey, Hixton's principal, believes that is why she "gets [the] kids": she had similar life experiences as a lot of her students and a lot of the students at Hixton. Studies have noted that although some teachers draw on children's home and community experiences as they are planning mathematics lessons, the connections they make are often superficial ones, changing names in problems, and adjusting contexts to reflect students' interests (Nicol & Crespo, 2006). *La*

maestra Icela showcased the use of linguistic and cultural resources in meaningful ways that were directly related to learning, thus maximizing those resources. In the example about solving a problem about tamales for a *quinceañera*, for example, she included the name of one of her students, Lisbeth, which could be considered a superficial way of making a cultural connection. In addition, though, she talked about tamales and made reference to how they are made. Knowing that tamales are cooked in corn husks and that you need two to contain the dough, especially when they are filled with meat and sauce and using only one could result in the sauce leaking, is a fund of knowledge in many Mexican-American households.

It is also important to note again that *la maestra Icela* was not the only Mexican teacher at Hixton Elementary. As a matter of fact, of the five teachers observed during this study, four of them were of Mexican origin, all having arrived in the United States during elementary or middle school, except for Mr. C who arrived here after college. However, in my analysis, it was her *cariño*- caring- for her students and her meaningful use of her shared linguistic and cultural repertoires that helped her students feel and be more successful. As Ms. Dewey stated, she was actively finding ways to "get things" out of her students that others could not (Ms. Dewey, interview, 5/7/2013).

The way la maestra Icela used translanguaging was more strategic than I observed in other classrooms. In one of her math lessons in Spanish, she had a student read the problem and as they discussed possible answers, one of her students who favors English explained her strategy in English (Field notes, 5/14/2013). Rather than shaming the use of English, she allowed her to finish her explanation. However, unlike Ms. Martínez, who never called out her students on their use of English, *la maestra Icela* asked the student to try to say the same thing

in Spanish. She also invited other students to help her with words specific to the context to help the student formulate her thoughts. La *maestra* Icela's disposition and attitude during teaching created an environment where sharing was encouraged because of the linguistic support she provided. She rarely called something right or wrong.

Maestra Icela: *A ver, vamos a ver por qué, ¿cuál es la diferencia?*

Let's see, let's find out why, what is the difference?

(Field notes, 5/9/13)

"*Vamos a ver*" was a common expression for *la maestra Icela*, an invitation to her emerging bilinguals to explore and play with language and content. *Vamos a ver* was usually followed by an insightful question or a proposal. Why? How come? How would it change? Her playful manner often challenged students to see and think beyond what was in plain sight and it implied group thinking, so no student was singled out. This approach, in my opinion, is the linguistic representation of the community-bent behaviors that researchers have found to be enacted among Latino bilingual students (Greenwood et al., 2001; Holtzman, Díaz-Guerrero & Schwartz, 1975; Kagan, 1980; Kagan and Madsen, 1971; Madrid, Canas & Ortega-Medina, 2007; Madrid et al., 2003; Reese et al., 1995; Sanders, Scholz & Kagan, 1976).

Most of the time, as in this instance, she asked others to join in the discussion and asked a lot of questions of students to support their oral explanations of the strategies that they would choose to solve problems. Everything children had to say was important and needed to be heard; however, she offered ways to support students' language when expressing

something in a language in which students did not feel as comfortable, as in the prior examples with Julia in this chapter.

The use of translanguaging for the purpose of clarifying concepts, explaining ideas, and extending learning in *la maestra Icela*'s classroom provided richer uses of translanguaging and expansion of linguistic repertoires for all students in her classroom. It is interesting to mention that in the design of her lessons, she did have the class spend some time working as a whole group, whereas students in other teachers' classrooms worked almost exclusively in collaborative groups. While whole group instruction, for some, represents decreased instructional intensity, *la maestra Icela* used this configuration often to model language use and provide students opportunities to present their ideas to each other and to reinforce the idea of group learning. In other words, the activities and linguistic resources in her classroom ecology matched; both were centered on maximizing linguistic resources and on creating a culture of learning as a group rather than as individuals.

Formal and informal supports

While Newberry school district provides ongoing professional development, most of it has been designed to target the TWI program and not classrooms, like that of *la maestra* Icela's, which only have emerging bilinguals who identify Spanish as their home language and which are part of the TBE program. "They have been, kind of, allowed to go and do whatever they've wanted to do," Ms. Dewey shared during her interview (5/7/2013). The challenges for those middle grades, according to her, is that they are now supposed to be teaching 50% in Spanish and 50% in English and they have not been given a lot of guidance. Therefore, Ms.

Dewey and *la maestra* Icela discussed it, and they came up with their own language allocation, teaching math in Spanish in the morning and then in English in the afternoon, and doing the same concepts in both languages.

According to the instructional model the district is using for TWI programs, Teaching for Biliteracy, the same content should not be taught in both languages because when emerging bilinguals do not understand the concept in one language, they might wait until it is taught in the other language instead of learning through the language in which they do not feel comfortable (Beeman & Urow, 2013). However, Ms. Dewey, who has observed *la maestra* Icela often, says it does not appear that that is what is happening in her class. As a matter of fact, she conducted a quantitative study using Statistical Package for the Social Sciences (SPSS), a software program for statistical analysis at a state university, on *la maestra* Icela's class and the rest of the 4th grade to try to understand what was going on with that class, and la maestra Icela's classroom was an outlier, with students doing significantly better than those in other 4th grade classrooms in the district, including monolingual English, maintenance bilingual and TWI programs. They also outperformed the gifted students in the school. "These kids come to us with rich, more background knowledge that we know about and that we tap into and yet we tell them that they are low," Ms. Dewey stated, "And they're not." (interview, 5/7/2014). However, regardless of the growth observed over that school year, looking at the data from their summative high-stakes state test, they still did not meet the Annual Yearly Progress that the state had established for the school year.

> *Their growth was far greater than all of the fourth grade, all of them, including the gifted kids and yet, they're considered low because they're speaking two*

> *languages, and they're not… they're reading… we have to hit the one whatever number, and I just can't understand why we think this is okay.*(Ms. Dewey, interview, 5/7/2014)

As Ms. Dewey explained during her interview, as an educator, she felt that the accountability system was not fair. However, as an administrator she did not feel that her peer administrators supported going against the accountability system. "That's what we are being measured against so you have to pay attention to it," they had told her, "You have to do it." (interview, 5/7/2013). With a background in democratic education and a deep commitment to the community and her teachers, Ms. Dewey felt she and her peers had to "stop, and say no," to the over-testing of students. However, she was hoping some of her peers in nearby communities would support her and did not want to have to do it alone. In the meantime, she created spaces for contestation by making decisions based on what she saw worked, like *la maestra* Icela's approach to bilingual education, even when the methods or models were not in agreement with those of the district. She had observed, respected, and supported *la maestra* Icela because she saw that the model worked, that emerging bilinguals were learning and were happy to come to school (her classroom had near perfect attendance), and because she had seen the results from the data collected in her study.

Thanks to the strong support *la maestra* Icela had from her principal and the lack of direction from the district, she was able to take an eclectic approach in her teaching and address the needs of her students over any mandates. While *la maestra* Icela was very organized, she shared that she was always willing to change her plans depending on her

students' needs (interview, 5/8/2014). While l*a maestra* Icela shared some of the same culture, language and race of her students, she was aware that these are fluid and shifting:

> *La maestra Icela: Tengo un grupo muy variado. Tengo niños que favorecen el español porque, pues tienen bases muy bien fundadas. Sus padres hablan el español perfectamente, lo escriben muy bien, favorecen el español y tengo otros estudiantes que favorecen el inglés y tengo otros estudiantes que favorecen los dos, aunque están muy bajos académicamente… (la maestra Icela,* interview *5/8/2014)*

> *La maestra Icela:* I have a very diverse group. I have children who favor Spanish because they come with good foundations. Their parents speak Spanish perfectly, they write very well, they favor Spanish, and I have other students who favor English and I have other students who favor both, even though they are very low academically…

This interview excerpt shows her awareness of the variety in her students' linguistic proficiency and backgrounds. According to her, this informed her instruction. Thinking about her students' culture and language, not through a deficit lens, but as assets, was one of the ways in which she framed and explained how her instructional decisions were appropriate for her students (Bartell, 2011):

> *La maestra Icela: No puedo tratar igual a Manuel que a Juan Carlos... Los papás de Manuel hablan el español perfectamente, lo escriben muy bien, su mamá se queda en casa…Juan Carlos tiene sólo su mamá y dos hermanos mayores. Él ya*

casi no habla el español… favorece el inglés… tengo que buscar maneras de que los dos aprendan aunque hablen y vivan de diferente manera (la maestra Icela, interview *5/8/2014)*

La maestra Icela: I can't treat Manuel in the same way I do Juan Carlos... Manuel's parents speak Spanish perfectly, they write it very well, his mom stays at home…Juan Carlos only has his mom and two older brothers. He does not speak Spanish as much any more…he favors English…I have to find different ways so that they both learn even if they speak and live differently from each other…

Her caring discourse about the emerging bilingual students in her classroom goes beyond her concern for their learning at school. She understands the importance of all of her students being able to speak and communicate in Spanish and English, especially because she has seen this have a direct impact on her students' relations with their parents. As she talks about her own language policy, *la maestra Icela* explains why this is important to her:

La maestra Icela: Pues yo a ellos sí les digo, "en la tarde solamente español, solamente me hablan español," pero pues…y esa es una de mis metas para el año entrante, digo, tengo que hacer algo [para que hablen español]…porque veo… por ejemplo, algunos niños ya no pueden comunicarse con sus papás…[los papás] les hablan en español y [los niños] solo contestan en inglés…y a veces ni eso…(*La maestra Icela*, interview, 5/8/2013).

I actually do tell them, "only Spanish in the afternoon, you only talk to me in Spanish," but well…, that is one of my goals for next year, I mean, I have to do something

> [to get them to speak in Spanish]…because, I see…for example, some children can't communicate any longer with their parents…[the parents] speak to them in Spanish and [the children] only answer in English…and sometimes not even that…

Translanguaging as pedagogy

Given the potential of translanguaging in the education of emerging bilinguals, translanguaging is explored as a pedagogy in each analytical chapter. In preceding chapters, however, examples from the data provided evidence suggesting considerations and cautions about the use of translanguaging, given the examples of its use in non-strategic ways or in highly structured and inflexible ways. In each of the preceding chapters, the result was either lack of evidence of translanguaging being used for meaningful purposes related to teaching and learning, or the lack of evidence of translanguaging at all. In this chapter, however, *la maestra Icela* provided examples of the use of translanguaging for meaningful uses in teaching and learning, albeit in opposition to the district policies. As her principal, Ms. Dewey explains,

> *La maestra Icela has been able to get out of those students things NO ONE can get out of them. It's incredible. […]...we have wonderful teachers here, but there's just something special about her classroom. And I think it's because she is not trying to fit them into some other box. She knows who they are and she gets them to do what needs to be done.* (interview, 05/08/2013).

While program frameworks like *Teaching for Biliteracy* can ease the implementation of language allocation, no framework can ever foresee the various ways in which students learn and use languages, especially in multilingual contexts where individual experiences are diverse and complex. From my observations related to the use of translanguaging in *la maestra Icela*'s classroom, the following practices had positive effects on the teaching and learning of emerging bilinguals:

1. Translanguaging practices, like other language practices, mediate learning when used for meaningful and relevant purposes in authentic contexts
2. Translanguaging practices afforded extended learning opportunities when recognized and maximized
3. Translanguaging as a pedagogy in the classroom was connected to, but not solely dependent on, the teacher's knowledge of students' language repertoires and of students and content, and on her ability to prioritize learning over a pre-determined plan of instruction
4. Translanguaging happened spontaneously; however, the development of meta-cognitive and meta-linguistic skills was intentionally planned for and strategically developed when the opportunity arose.

Following I will show examples of how these four practices were evident in *la maestra Icela*'s repertoire.

La maestra Icela did not necessarily plan meaningful and relevant activities in which to use translanguaging. As a matter of fact, *la maestra Icela* did not plan for translanguaging.

While it is important to reflect and be attentive to the use of language, translanguaging is not something for which you plan or something you can schedule into your program. What she planned for were activities related to the content in a way that was meaningful and relevant to her students' experiences, such as the earlier example of problem solving for corn husks needed to make tamales. She rarely used the mathematics textbooks; instead, she created her own math problems using online resources and school and community life examples.

La maestra Icela used translanguaging to clarify concepts and extend learning. When discussing number operations and problem solving, she used the context of the local Mexican market, *quinceañeras* or the use of local produce, to name a few examples, that she knew students used in their homes. She included contexts related to cooking, shopping, playing in the schoolyard and even visiting the mechanic. Translanguaging occurred naturally when discussing making tamales or buying tortillas, but her use of translanguaging did not focus on the context as much as on its use to deepen understanding, clarify ideas and extend learning. In the next example, we see how she uses translanguaging as a tool to deepen her students' understanding of how numbers are used in Spanish and English, and to raise their cognitive engagement with a seemingly simple task.

La maestra Icela:¿Quién me puede leer la siguiente? Juanita.

Who can read the next one for me? Juanita.

Juanita: Cincuenta y siete mil…

Fifty-seven thousand…

La maestra Icela: Pérame. Cincuenta y siete mil… A ver quién la termina de escribir más rápido, ¿ustedes o yo?

Hold on. Fifty-seven thousand…Let's see who finishes writing this first, you or me?

Juanita: It's long…*cincuenta y siete mil, treinta y nueve*

It's long…fifty-seven thousand, thirty-nine

La maestra Icela: Sí, tenemos todas las palabras que necesitamos, ¿verdad Joel? ¿Cómo lo diríamos en inglés?

Yes, we have all the words we need, right Joel? How would we say it in English?

[various students answering at once]: fifty-seven thousand, thirty-nine

La maestra Icela (pointing to number chart): *Tenemos los números que necesitamos, ¿verdad? ¿Cuántas palabras en inglés?*

We have the numbers we need, right? How many words in English?

[various students answering at once]: Three! *¡Tres! ¡Five! ¡Cinco!*

La maestra Icela: A ver, vamos a ver por qué, ¿cuál es la diferencia?

Let's see, let's find out why, what it the difference?

After this exchange, *la maestra Icela* engaged the whole class in a discussion on the similarities and differences in the way numbers are written in Spanish and English, and students

shared their ideas in both languages. Notice that *la maestra Icela* did not code-switch throughout this particular dialog. As a matter of fact, her use of translanguaging was very purposeful; she used her knowledge of both languages to co-construct models of language use in Spanish and English as well as to compare and contrast the two language systems. While she used translanguaging socially and in varied ways, as did others I observed throughout the school, when she used translanguaging during instruction (while I observed her class) she used it in cases like this, to highlight language use or content details. She also used translanguaging practices when communicating with individual students, especially to restate directions or to explain concepts to emerging bilinguals with emerging Spanish language proficiency.

In the example above, *la maestra Icela* used translanguaging strategically to engage students in a conversation about language. It is important to know that the content goals of the lesson were related to problem solving and not to writing numbers. However, when Juanita made a comment in English about the length of the number when saying it in Spanish, *la maestra Icela* did not ignore her comment in English:

Juanita: *It's long…cincuenta y siete mil, treinta y nueve*

It's long…fifty-seven thousand, thirty-nine

La maestra Icela: Sí, tenemos todas las palabras que necesitamos, ¿verdad Joel? ¿Cómo lo diríamos en inglés?

Yes, we have all the words we need, right, Joel? How would we say it in English?

While *la maestra Icela* did not switch into English, she recognized that Juanita's comment about the number of words in Spanish and English to say the same number indicated that she was thinking about the various linguistic experiences that formed part of her linguistic repertoire. In Spanish, it takes 7 words to read 57,039, while in English, it takes five words. One of the reasons that *la maestra Icela* gave for this during their discussion was that Spanish does not use compound words as much as English does, especially when labeling numbers. Further, she explained that the use of the conjunction "*y*" in Spanish to create numbers increases the number of words that one needs to use in order to label numbers higher than 20. While most emerging bilingual individuals in her class seemingly knew these facts, it was unclear if they had thought about them before this discussion. What *la maestra Icela* did was to raise her students' awareness of these linguistic differences between English and Spanish, which are sometimes left to the individual to figure out, unless they are learning a language formally as an additional language. Even in cases where individuals are learning the additional language, many times the focus is on learning about the additional language and not on comparing and contrasting the various languages the emerging bilingual may know. What was interesting about this particular scenario is that when I discussed it after class with *la maestra Icela*, she mentioned that it was something she found interesting and that she wanted to follow up with Juanita's sudden realization, but she did not mention she was seeking an opportunity to think about language differences. She originally had not even planned to talk about numbers.

Another pedagogical direction *la maestra Icela* did not take was to ask Juanita to speak in Spanish only, given that the mathematics class was being taught in Spanish. Once again, she recognized that translanguaging was taking place implicitly and chose to make her experience

explicit and transform it into a group experience by bringing others into the conversation and helping students verbalize the observation Juanita was making. In other words, she saw this opportunity for deeper learning, not only for Juanita but also for her peers. Also implicit in her actions was the message that it is okay to be bilingual and to think in and about both languages when learning. Indeed, the message was that translanguaging, using all of the students' available linguistic repertoires *as one comprehensive system*, is not only okay, but is expected during teaching and learning in *la maestra Icela*'s class.

As mentioned earlier, the goal of the lesson was not related to how to say numbers in Spanish and English, but instead, it was related to problem solving. *La maestra Icela* chose to put aside her plan for the lesson and instead, follow Juanita's curiosity about the use of language. This is one of the unique ways in which I observed *la maestra Icela* conduct her class over and over. While other bilingual educators were concerned about the specific number of hours they spent teaching and their students learning in one language or the other, and on catching up to the standardized curricular plan, *la maestra Icela* continually deviated from her plan to allow for flexibility and for inquiry from her students. This behavior is what I am labeling prioritization of learning over planning.

Prioritizing learning over planning does not mean that educators do not plan. *La maestra Icela* planned both individually on a daily basis and with other 4th grade teachers on a weekly basis, and she covered the same content as other 4th grade classrooms. Her activities and pace were different, however, guided by her students' inquiry related to both content and language, which was both planned and spontaneous, as shown in the example provided above. Further, while she sometimes did not plan for the spontaneous conversations related to the use

of language, she did plan for specific times to talk about language and about learning in two languages (interview, 5/8/2013). Further, she believed that her students benefited from thinking about how they learned math and used language so she kept her attention on opportunities to do it. I believe that she was so used to it, that she did it naturally, as exemplified in the earlier example with Juanita, and sometimes she was not even aware of this practice. While translanguaging is natural and spontaneous for emerging bilinguals, as we can see by the various examples in this chapter, many opportunities are lost when educators choose to ask students to "stay" within their lesson plan, or to artificially separate their languages.

Summary

In this chapter, I chose to examine *la maestra Icela*'s practices when teaching mathematics to her group of emerging bilinguals. Early on, I realized that she preferred large group instruction to small group or individual work. While participation patterns are neither good nor bad in and of themselves, they need to be utilized intentionally to align with learning goals and the context of the classroom. From an ecological perspective, it is relevant to analyze that context, including the activities and linguistic resources used to mediate the learning. Further, attention to the context within which they are deployed matters as well. For *la maestra Icela*, addressing her students' academic and linguistic needs was important, but instead of adhering to particular program models, she used cues from her students to guide her instruction. While Ms. Dewey stated that *la maestra Icela* could get from her students things

that others could not, I believe the secret is that she was not trying to get things out, but would listen and be ready to take the things her emerging bilinguals would offer.

As for translanguaging, like other linguistic resources in her classroom, *la maestra Icela* used it to mediate learning only when relevant and meaningful instead of at pre-determined times. She used translanguaging practices when they afforded extended learning opportunities, and while she maximized them often, it was not always clear if she recognized them as translanguaging. When questioned informally, she would call them "*interesante*" (interesting) events in her classroom. Her impetus for addressing these situations or events was more about her interest in prioritizing her emerging bilinguals' learning and meta-cognitive or meta-linguistic skills than it was about a pre-determined plan of instruction (interview with the teacher, 5/8/2013).

A major finding in her classroom was the root for many of her practices, which was not related to her own philosophy or beliefs about language use, but strongly related to her *cariño* (caring) for the children in her class. I have chosen to use children here instead of emerging bilinguals because *la maestra Icela* was interested in Juanita, Joel, Manuel and the rest of the children in her class holistically, and not only in their linguistic attributes or cognitive traits. To me, it was an important reminder that regardless of the use of specific tools or practices, the teacher has a major role in the design of the ecology in the room. Working with her children's histories and her own –especially in regards to languages and cultural backgrounds- allowed her to make strong connections with her students and provide learning opportunities that they may have not had in other classrooms. I want to reiterate once again that teachers' histories, languages and cultural backgrounds need not to be the same as their students', but teachers

need to allow histories, languages and cultures come into the classroom and be connected to the everyday teaching and learning.

While cariño is not something you can teach in professional learning, it is something that can be modeled and encouraged in professional learning. Instead of spending hours learning and training in specific program models, professional learning can be designed around dialog and reflection on students' assets and how they can be incorporated into teaching and learning.

CHAPTER 7: DISCUSSION, CONCLUSIONS, AND SUGGESTIONS FOR FUTURE RESEARCH

Discussion and conclusions

The purpose of this study was to examine how language is used in multilingual contexts during mathematics instruction. The questions guiding the research were (1) what factors shape language use in multilingual classrooms?, (2) how is language employed in multilingual classrooms in learning and teaching, specifically during mathematics instruction?, and (3) does translanguaging occur in multilingual classrooms? If so, how might we understand it? Can we identify any impact of translanguaging on learning?

The goal was to better understand how emerging bilinguals use their linguistic repertoires to add to the body of literature that views bilingualism as an asset, but also to examine practices in these learning spaces that leverage student learning. The data captured during this study provided evidence to support the use of fluid language practices during math instruction by emerging bilinguals. Translanguaging, moving across various languages as a part of a single linguistic repertoire, was observed while emerging bilinguals were engaged in multiple mental processes, during social situations, as a means to clarify understanding and as a way to engage in metalinguistic conversations. While these functions were initiated mostly by students, the role of the teacher was to serve as a model or to offer an invitation to maximize opportunities. In cases where teachers did not recognize or encourage the discussion, the purpose and effectiveness of the use of translanguaging were not as evident as in the cases in which the teacher engaged the students in deeper reflection. In this section, I will discuss each of these conclusions further.

Multilingual classrooms are spaces in which students and educators come together, each possessing various linguistic and cultural resources. However, multilingual programs vary distinctly from each other in language policies, language allocations, student populations, and pedagogical approaches and strategies. This study took place in a rural town in which the school district had decided to offer a two-way bilingual immersion (TWI) program in Spanish and English to all students. Within the TWI program, 50% of the emerging bilinguals came from homes where the language spoken was English, and 50% of the emerging bilinguals came from homes where either Spanish or Spanish and English were spoken in the home. Since at the time of the study the program had only been in effect for six years; not all of the classrooms observed were part of the TWI program. As a matter of fact, only two of the classrooms observed were part of the TWI program and the other three were considered part of a maintenance bilingual program, in which all students were of Hispanic origin and where language allocation was 50% English and 50% Spanish.

The data collected were analyzed through cognitive and socio-cultural lenses within an ecological framework to explore the complexity of the interactions in the bilingual classroom space. As part of this study, I observed how the different languages and language varieties in multilingual classrooms were used by students and their educators as tools to mediate the teaching and learning of mathematics. The goal of my study was to add to the existing research on how educators can manage and organize content instruction, including the use of translanguaging practices, to enhance opportunities for academic achievement for emerging bilingual students.

In Chapter 4, I built a conceptual argument on the nature of translanguaging and supported it using representative examples from data collected in Mr. C's classroom. My claim is that the use of translanguaging practices by students serves as an internal micro-process that affords the sustainability of multiple simultaneous mental processes. Students engaged in translanguaging while problem solving, simultaneously worked on mental calculations while processing language. Nevertheless, while I found data to support emerging bilinguals' use of translanguaging and cognitive engagement in multiple simultaneous mental processes in this classroom, I was not able to find evidence of grade-level appropriate mathematical practices in the same classroom. The data on translanguaging practices during group work showed no evidence of productive mathematical conversations or effective group work, probably a result of lack of guidance on how to work effectively in groups.

The lack of uses of translanguaging practices to achieve deeper learning and effective group work, according to the data collected, was a result of the lack of structure and poor design of instructional activities and learning spaces and not related to the affordances of translanguaging practices themselves. Further, the use of translanguaging by the teacher in the classroom focused opportunities for the use of traslanguaging around simple requests for or confirmation of information and not on questioning the interpretation and contextualization of problems to solve or on specific learning strategies. An implication of these observations is that while translanguaging can be a powerful tool in teaching and learning that affords emerging bilinguals unique opportunities to maximize their learning, the lack of explicit modeling and a nurturing instructional design significantly limits its potential.

In Chapter 5, I analyzed data collected in one of the 5th grade TWI classrooms. In this classroom, two teachers team taught using Teaching for Biliteracy (Beeman & Urow, 2013) as a pedagogical model for language instruction. This is the same program used across all of the TWI classrooms in the district, but not necessarily in all bilingual classrooms. In this model, a unit of study is taught in one language and then the Bridge, one extension activity in the language other than the one used for instruction, takes place following the culmination of the unit. The data collected in this classroom did not include evidence of translanguaging by any of the students. The unit was taught in English and the Bridge took place in Spanish, that is, the teacher used Spanish for the activity, but the students did not use Spanish orally at all during the activity. When asked to write about the activity at the end of the period, they were not able to produce the answers in Spanish. As a second attempt, the teacher modeled the writing in the following class, and this time students replicated the exact text as in the model with no original text of their own. Without specific support in developing translanguaging skills, such as learning a concept in one language and discussing it in a second language, emerging bilinguals' potential for transfer across contexts becomes limited. I believe that it was the lack of encouragement for deeper reflection and for the use of Spanish that resulted in emerging bilinguals not using the language during the time when they were supposed to. In conversations with the teachers, it became evident that educational systems must take into consideration their contexts and the personal, family and group histories when adopting instructional frameworks. In this study, for example, the teachers' personal histories with and beliefs about linguicism impacted their willingness to ask students to use Spanish, which was also the language with lower status in the school. Since math was taught in the language of

power (English), not demanding that students use Spanish maintained the status quo of English. Using Spanish as the language of the Bridge, but not requiring that students use it, not only allowed students not to engage in Spanish, but also perpetuated its marginalization in educational contexts.

Several factors impacting the effectiveness of Teaching for Biliteracy (Beeman & Urow, 2013) at a systems level were identified in this chapter. First, the professional learning opportunities and resources related to the framework were not available to all teachers, only to teachers in the TWI program. Secondly, many of the professional development activities included attendance at workshops, but there were limited resources for job-embedded, ongoing professional learning that allowed for reflection and dialog about children, instead of program models. Lastly, with a limited number of staff knowledgeable about the framework and limited resources and time for planning, it was hard to establish professional learning communities among the bilingual educators in the school. The teachers interviewed who were in TWI classrooms noted that they did not know who to go to with questions about implementation.

While no one-size-fits-all instructional approaches really fits all instructional programs and contexts, based on my observations, I propose some factors that should be considered as educators make decisions when trying to maximize the use of translanguaging, in instruction. These considerations include: (1) promote classroom ecologies in which translanguaging takes place during instruction to provide students opportunities to use it as a tool for learning; (2) incorporate translanguaging in meaningful and relevant tasks; (3) select tasks that require deeper levels of knowledge and challenging cognitive demands; and (4) balance the power

differential between languages by avoiding strict language separation and by supporting an additive perspective on bilingualism through equitable availability of resources, visibility of both languages throughout the environment in which students learn and play, and by avoiding giving preference to large-scale assessments over meaningful time for exploring and playing with language.

In Chapter 6, I examined the linguistic and pedagogical practices of a teacher who was effective as defined by the school principal and as identified in the data collected during her instruction of emerging bilinguals. This teacher did not follow any particular approach as the other classrooms did (e.g., Teaching for Biliteracy). Further, while there was language allocation for particular times of the day, the use of language practices was fluid. However, what characterized the use of language in this classroom was that it was both intentional and strategic, while also being spontaneous and playful. Data from this classroom showed that participation patterns were varied; however, none was particularly good or bad in and of itself. What made the particular approaches and patterns useful was that they were utilized intentionally to align with the students' learning goals and the context of the classroom. Further, attention to the context within which they are deployed matters as well. In my opinion, the effectiveness of this teacher lay in that she would listen and be ready to respond to ideas and questions her emerging bilinguals would offer. Then, she would take approaches that were meaningful to them and provide the support they needed.

The data from this classroom drove me to include an analytical lens of *cariño* (caring), which, to me, described this classroom's teacher's pedagogy and her interactions with the emerging bilinguals in her class. From all the data collected, this was the most powerful and

surprising to me. While the finding is neither new nor innovative, it does support the role of the teacher and the design of spaces for learning as most valuable in education. The goal of this study was to examine how language is used in multilingual contexts during mathematics instruction. Cariño was one of the factors, identified by the data collected, that shaped language use in the multilingual classrooms and that impacted learning in the most significant way. Other factors included how the teacher modeled and discussed the use of language in authentic ways during instruction. Chapter 6 showed various ways in which the teacher was flexible in the use of translanguaging during learning and even promoted it through direct questioning about language use when her students showed interest or curiosity.

During mathematics instruction, translanguaging helped emerging bilinguals to engage in multiple mental processes and was a powerful tool when used in problem solving. However, it is important to highlight that the use of translanguaging in and of itself was not as powerful as when it was intentionally and strategically used by educators who were aware of their students' needs and strengths. In other words, what is key is the educator's intention to maximize the opportunity of translanguaging when it occurs, once he or she recognizes it, in order to leverage a 'teachable moment'.

As I looked for data to inform the factors that shape language use in the multi-lingual classrooms in this study during mathematics instruction, I found that program models have a major impact. Specifically, language program models that a district or school select guides the ways and opportunities that students experience language use. First, whether a bilingual program was transitional, developmental or two-way immersion dictated who was present in the classroom. In transitional and developmental programs, students were typically from

Spanish language backgrounds, while in the two-way immersion program there were emerging bilinguals from both English and Spanish language backgrounds. Secondly, the instructional model used in this school was different depending on the type of program: two-way immersion classrooms used the Bridge, but other bilingual classrooms did not follow that model. While the Bridge had the potential to promote discussions about language use, the Bridge did not promote creative uses of language. Language models were also different across bilingual classrooms in the developmental models. The district instructed teachers to teach different subjects in different languages and never to re-teach the same topic in both languages. Further, the district supported the idea of language separation, though no official language policy had been created. Such unofficial policies mitigated against successful translanguaging strategies except in exceptional circumstances in which the teacher chose to focus on students' needs instead of on the instructional model constrains.

Another factor that shaped language use was the pedagogical approaches that teachers used, which impacted not only language use, but also emerging bilinguals' opportunities to learn. While all the classrooms observed used group work as a strategy to afford students negotiation of meaning, in most classrooms, these interactions were not deep enough or sustained. While translanguaging was present in these cases and students used it to leverage their learning, it was not nurtured. The lack of success of scaffolding strategies had little to do with the students' use of language and everything to do with the lack of thoughtful instructional designs on the part of the teachers. Specifically in mathematics learning, it is important that students engage in mathematical conversations and that they engage in problem-solving of challenging materials. Without tools to negotiate meaning and participate

in mathematical conversations, emerging bilinguals were not afforded opportunities for learning. On the other hand, students who were the most successful in academic and linguistic growth experienced a cariño pedagogy, through which their teacher focused on their strengths and used culturally informed approaches to teaching. The language use of these children was strongly influenced by conversations about language and about learning.

The forms of language employed in multi-lingual classrooms during mathematics instruction also varied depending on the classroom ecology. In some classrooms, emergent bilinguals internalized the importance of English as the language of learning, reinforced by the testing practices in English and the lack of other language varieties throughout the school. In other classrooms, students engaged in translanguaging, moving across their various language varieties with ease. Using both cognitive and sociocultural perspectives, I found, gave a broader picture of the affordances that translanguaging offered emerging bilinguals. Through the cognitive lens, I was able to reflect on the various mental processes in mathematics learning and how translanguaging worked as a micro-process that supported the working memory of students. Students who employed translanguaging practices were able to use all language varieties in their repertoire as an integrated system that enhanced their cognitive efficiency and decreased the cognitive load.

In all classrooms observed, while I saw various strategies used in teaching and learning, it is clear that there needs to exist attention to language and scaffolding for language development in order for learning to be maximized for emerging bilinguals. This may include designing spaces in which emerging bilinguals are able to use language practices, including

translanguaging, in more flexible and creative ways than more formal structured approaches afford.

Significance of the study

This study seeks to contribute to the body of research in the fields of bilingual education, teacher education and professional learning as they intersect with mathematics learning and teaching. By examining language practices in multilingual school spaces, educators-including teachers, administrators and those involved in teacher education- and researchers will be able to better understand how teachers and students use language to mediate learning and develop mathematical thinking. The understanding of the use of language to mediate learning can support educators to plan the learning experiences of emerging bilinguals in these contexts. Further, it can inform the development of teaching and learning strategies that are based on authentic ways in which emerging bilinguals use language.

While many educators seek the best program or instructional model, this research only serves to reinforce the fact that it is not the program or instructional model that impacts learning the most, but the everyday interactions that educators are able to offer their emerging bilinguals. For these students in particular, those interactions need to have a focus on challenging mathematical thinking and on language use. For those interested in designing professional learning for bilingual educators, this research suggests that bilingual educators need opportunities to discuss what conversations about language use sound like and what effective mathematical conversations sound like.

Finally, for educators in charge of the administration of schools and districts, this research proposes that structured and inflexible models do not meet the needs of all students, especially when emerging bilinguals come from very different language and cultural backgrounds. Such models may, instead, mitigate interesting and effective uses of language. Further the fidelity in implementation of such programs require a lot of professional training on how to enact the model, missing opportunities to engage in deeper professional learning that helps bilingual teachers grow in their awareness and ability to identify teachable moments related to language and mathematics.

Limitations

This research study took place in a small district with only one building for grades K-3, Carsten Elementary, one for grades 4-5, Hixton Elementary, one junior high and one high school. At the time of this research, Hixton Elementary's available services for emerging bilinguals were either Transitional Bilingual Education (TBE) or Two-Way Immersion (TWI) programs. All of their emerging bilinguals who had been identified as English language learners were Spanish speakers and were enrolled in one of the two programs. The size and rural nature of the district, and its decision to offer TWI programming for any child entering kindergarten can be categorized as atypical and be construed as a limitation to the study. However, the study can also be seen as a counternarrative to the way research has typically represented rural districts and the opportunities it offers emerging bilinguals. The qualitative nature of the study also affords the opportunity to tell stories of success, such as those in la maestra Icela's class that would have not been possible to examine if the criteria used to define

the students in her classroom was only quantitative data from summative assessments that focus on making the mark, rather than looking at the growth.

The participating students' families had strong commonalities with respect to socio-economic status, parent education, annual income, home language use and self-identified ethnicity (e.g. Mexican and Hispanic). While these commonalities limit findings with respect to generalizations about family engagement and family values and beliefs about language use because of the limited diversity and number of participants in the study, a large majority of emerging bilinguals in the US is from Mexican and Hispanic origin. Consequently, the study adds to the current knowledge in the field about effective ways to engage families of Mexican and Hispanic origin in the education of their children.

In order to limit the focus of the research, I only observed the language use in classrooms that were part of the TBE or the TWI programs. However, there were some classrooms that I considered multilingual spaces given the fact that there were students who identified Spanish as their home language, but they were not part of the bilingual program. An extended research to include those classrooms could have provided additional data on the use of language in programs that did not follow a bilingual model. However, adding classrooms to this particular study would not have been possible due to the conflicting schedules for math instruction.

Suggestions for future research

While it is clear that translanguaging is most effective when it is used in spaces that have been strategically designed for meaningful interactions and appropriate scaffolding, and that the teacher's instructional design is key in promoting students' academic and linguistic development, the study did not address how much translanguaging is used outside of school by the students in the research. Therefore it was impossible to determine from the existing data if students' use of these practices outside of school influenced their use inside of school. In other words, data did not provide evidence that the teacher or the peers were the only models for the use of translanguaging practices. Further analysis of emerging bilinguals' use of language in and out of school and examination of how these practices influence the use of language across settings may provide a better understanding of such practices. Funds of knowledge have been shown to be transferrable across settings and be useful tools in leveraging teaching and learning in the classroom. While we are aware that translanguaging practices take place outside of school, further examination of how they are used and how they can be maximized within school is needed.

One question that continually arose for me during my research was why, even though everyone I interviewed was aware of one of the teachers' success with emerging bilinguals, other teachers did not follow or even choose to observe her use of translanguaging practices. All teachers were positive about the use of multiple languages, but most chose to follow a model that, while popular in the state, had not proven successful in their school, whether it was for lack of fidelity of implementation or lack of contextualization. On the other hand, this one

teacher had been successful for many years and no one but the principal chose to go into her classroom to observe. Exploring how collaboration among bilingual teachers can enhance bilingual programs and promote the exchange of effective practices would be of interest, given the success that such collaborations have had in other areas of instruction.

Another area to research is teachers' understanding and awareness of language practices, how such awareness develops, and how teachers use these language practices effectively and systematically. The professional learning involved in developing this understanding would benefit educators and those interested in translanguaging as more than just a phenomenon, but as a valuable tool in pedagogy. I would strongly propose that a long term research study with teachers who are willing to commit to language fluidity in their classroom be conducted to look more deeply into the educators' histories, ideologies, and values and beliefs, to come to a better understanding of how they impact how teachers leverage translanguaging as a pedagogical tool.

Lastly, further research needs to happen on the dichotomies that exist in the conceptualization of translanguaging. Understanding translanguaging as moving across different codes or within a system has implications on its relation to metacognition and how these two constructs may or not be able to work together. To date, the work on metalinguistic awareness has been based on the assumption that students move across different linguistic systems. However, in light of current conceptualizations of translanguaging, theoretical and empirical research could address the role, if there is one, of metalinguistic awareness when language is used within a single system or whether such a paradigm has the need for a new conceptualization we have not thought of yet.

Data supported that translanguaging can support multiple mental processes for emerging bilinguals, that traslanguaging can have value in incorporating emerging bilinguals' funds of knowledge, and that it can support a strengths- based approach to the education of emerging bilinguals. However, the data also strongly suggested that translanguaging, while a natural phenomenon among emerging bilinguals, when leveraged and encouraged can have enhanced pedagogical value in the mediation of new learning and deeper mathematical understanding. In order to validate this argument, further research is needed.

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Appendix A

Templates for field notes and memos

Date: _____

Class: _____

Time	Notes

Template for Memos

Date: _____

Class: _____

Theme/Topic	Observations	Interpretations/Ideas/Opinions

Appendix B

Handouts

Page 1:

Nombre: _____ # _____

Resuelva cada problema incluye un dibujo para el problema. Una vez que tengas la respuesta explica como resolviste el problema y como sabes que tu respuesta es correcta.

Perímetro y Área

Danny tiene un jardín de rosas rectangular que mide 8m por 10m. Necesita agregarle fertilizante. Si una bolsa de fertilizante puede cubrir 16m2. ¿Cuántas bolsas necesitaría comprar para poder cubrir todo el jardín?

Dibujo.

Lo que hice para obtener me respuesta fue…

_____

_____

Translation

Name: _____ # _____

Solve each problem include a drawing for the problem. Once you have the answer explain how you solved the problem and how you know your answer is correct.

Perimeter and Area

Danny has a rectangular rose garden that measures 8m by 10m. He needs to add fertilizer to it. If a bag can cover 16m2. How many bags would he need to buy to cover the whole garden?

Drawing.

What I did to get my answer was…

_____

_____

Page 2:

Nombre: _____ # _____

Resuelva cada problema incluye un dibujo para el problema. Una vez que tengas la respuesta explica como resolviste el problema y como sabes que tu respuesta es correcta.

Perímetro y Área

Nathalie está haciendo un tablero de anuncios de la escuela para el concurso de talentos. El tablón de anuncios es de 10 pies rectangulares. Si tiene que ponerle cinta al tablero y cuesta $2 por pie, ¿cuál sería el costo para agregar cinta alrededor del borde?

Dibujo.

Lo que hice para obtener me respuesta fue…

_____

_____

Translation

Name: _____ # _____

Solve each problem include a drawing for the problem. Once you have the answer explain how you solved the problem and how you know your answer is correct.

Perimeter and Area

Nathalie is making a school bulletin board for the talent show. The bulleting board is 10 rectangular feet. If she has to put tape around the bulletin and it is $2 per feet, how much will it cost to add tape around the edge?

Drawing.

What I did to get my answer was…

_____

_____

Appendix C

Interview Protocols and Surveys

Semi-structured interview with Classroom Teacher

1. How do you use language during instruction?
    a. To help students understand the content better?
    b. To engage all students in participation of activities?
    c. To ensure students are learning the language of school?
    d. How do you feel about the way you use language in your classroom?
2. How do students use language in the classroom?
    a. For learning?
    b. For socializing?
    c. With other staff?
3. Does your district or school have language policies? How about in your classroom? What are they? How do you feel about those policies?
4. What programming exists for students who are multilingual? How do you feel about those programs?
5. From your perspective, how do your colleagues feel about
    a. existing language policies?
    b. programming for ELLs?
    c. Language use in school and the classrooms?
    d. multilingual students?

6. What challenges do you see related to language use in the classroom?
    a. how do you approach these challenges?
    b. What resources do you have available to help you deal with these challenges?
7. What additional resources or programs would you like to have or be able to offer in your school or for your students in your classroom?
8. Do you have any language goals for your students?
    a. If yes, how did you come up with them? How do you know when you have met them? What are they?
    b. If not, why not? Do you think it would be useful to have them? What resources are available to you to create some?

Semi-structured interview with School Principal

1. What programs do you offer related to language in your school?
    a. How do students qualify for those programs?
    b. How many students are currently in those programs?
    c. If parents decline the services, what are typically the main reasons for doing so?
    d. How do you feel about these programs?
2. Does your school have any policies related to language?
    a. If so, what are they?
    b. If so, what is the rationale for those policies?
    c. If so, how are those policies enforced? When are there exceptions to the policy?
    d. If not, do you think there should be?

    e. If not, what policies would you like to implement?

3. From your perspective, how does the staff feel about
    a. existing language policies?
    b. programming for ELLs?
    c. bilingual education?
    d. bilingual students?
4. What challenges do you see either for your staff or for your students related to language use in the classroom?
    a. How do you gain more information about challenges or concerns?
    b. How do you mediate those challenges or concerns?
5. What is the district's vision
    a. for services for students who are bilingual or multilingual?
    b. for providing access to bilingual education to monolingual speakers?
    c. how do you feel about the district's visions you just shared with me?
6. What additional resources or programs would you offer in your school related to language if you had additional resources?
7. How do/would you prepare your staff for those programs or for working with multi-lingual students?

Semi-structured Interview Protocol for Administrator

1. What is your vision for the education of students in your district?

a. For bilingual students?

b. For English speaking students?

2. How do you involve different stakeholders in the direction and vision of your programs?
    a. Teachers?
    b. Administrators?
    c. School board?
    d. Students?
    e. Families?
    f. Community?
3. What types of programs exist in the district? How do they support your vision?
4. What professional development do teachers and administrators receive to support this vision?
5. What resources do you currently provide schools?
    a. Teachers?
    b. Administrators?
    c. Students?
    d. Families?
6. What role, in your opinion, does language play in the education of students in your district?
7. How do bilingual students, in your experience, use language in ways that monolingual students don't?
8. Are there any language policies in your district? Who developed them? Who enforces them?
9. Who supports you?

Appendix D

Parent and Staff Surveys

Parent Survey

This survey contains questions about you, your child, and your family. The goal of this survey is to learn more about your beliefs about language and about the way your child and your family use language. Please answer as many questions as possible. The whole survey will take you approximately 15 minutes.. No individual information that may identify you or individual answers will be shared with anyone. If you have any questions about this survey, please contact Mariana Castro at mcastro@wisc.edu or at (608) 239-1617.

Please answer the following questions:

1. Who lives in your home in addition to you and your child? _____
2. Does your child spend considerable amount of time somewhere else (for example, child care, grandparents' house, etc.)? _____
3. What language(s) are spoken at home? _____ in other places where your child spends a considerable amount of time? _____
4. What language(s) do you speak? _____
5. What language(s) do you use to communicate with your child? _____

Please rate how much you agree or disagree with the following statements:

	Strongly disagree	Disagree	Agree	Strongly agree
1. People who speak more than one language have better opportunities for employment				
2. It is better to learn one language well before learning a second or third language				
3. Bilingual people are those who speak, read, write and comprehend two languages well				
4. Bilingual people are typically better at one language than the other				

5. Children can learn two language s at the same time				
6. Children who learn more than one language tend to get confused and mix the different languages they know				
7. When bilingual people mix languages, it means they are not yet fluent in one or both languages				
8. Bilingual people shift from one language to another effortlessly depending on the situation and with whom they communicate				
9. In every language, there is a standard form of that language, which is the correct way of using that language				
10. If people don't use the standard form of a language it's because of lack of education about that language				
11. People use language intentionally to send messages to particular audiences and to reflect who they are				
12. Schools should teach the standard form of languages, and not other varieties				

Please rate the following statements based on the frequency in which you experience each situation:

	Never	Sometimes	Often	Always
1. My child interacts with languages other than English in my community (for example: on newspapers, on the radio, on signs)				
2. People in my community respect and encourage the use of other languages				
3. My child interacts with languages other than English with relatives who do not live at home				
4. Our relatives respect and encourage each other to use or learn other languages				
5. I would like my child to learn other languages in addition to English				

6. Schools should teach all children other languages in addition to English				
7. I ask my child to speak to me in English				
8. I ask my child to speak to me in a different language than English				
9. Communities should provide information in multiple languages to ensure all have access to important information				
10. Our family supports bilingualism				

Please select the language your child uses for the following activities:

	English	Another language	Both
Watch TV or movies			
Listen to music			
Play			
Talk to siblings			
Talk to friends			
Use to communicate at home			
Use to communicate with relatives			
Use in school			
Other: _____			

Demographic information:

Write in the words you use to identify yourself

My race is _____

My ethnicity is _____

Please mark the information that best describes you and your family:

I am (18-25)____ (26-35) _____ (36-50) ____ (50+) ____

I finished (high school) ___ (2 year degree) ___ (4 year degree) ____ (grad school) ____

Our income is ($0-$30,000) ____ ($30,000-$60,000)____ ($60,000-$100,000) ___ ($100,000+)

If you would like to participate in an interview to talk more about your answers in this survey, please contact Mariana Castro at mcastro@wisc.edu or at 608-239-1617.

Parent Survey in Spanish

Cuestionario para padres o madres de familia

Este cuestionario contiene preguntas sobre usted, su hijo(a) y su familia. La meta de este cuestionario es aprender más de su manera de pensar sobre los idiomas y sobre la manera en la que usted, su hijo(a) y su familia usan el lenguaje. Por favor responda tantas preguntas como pueda. El cuestionario entero le tomará aproximadamente 15 minutos. No se compartirá con nadie ninguna información que pueda identificarle a usted o ninguna respuesta individual. Si tiene preguntas sobre este cuestionario, por favor contacte a Mariana Castro al mcastro@wisc.edu o al (608) 239-1617.

Por favor responda a las siguientes preguntas:

6. *Quien vive en su casa ademas de usted y su hijo(a)? _____*
7. *Pasa su hijo(a) tiempo considerable en otro lugar (por ejemplo, cuidado de niños, casa de algún familiar, casa de abuelos, etc.)? _____*
8. *Que idiomas se hablan en casa? _____ en los otros lugares en los que su hijo(a) pasa tiempo? _____*
9. *Que idioma(s) habla usted? _____*
10. *Que idioma(s) usa usted para comunicarse con su hijo(a)? _____*

Por favor marque que tanto esta de acuerdo o desacuerdo con cada una de las siguientes oraciones:

	Fuertemente en desacuerdo	*En desacuerdo*	*De acuerdo*	*Fuertemente de acuerdo*
13. La gente que habla mas de un idioma tiene mejores oportunidades de empleo				
14. Es major aprender un idioma bien antes de aprender otro				

15. La gente bilingue es aquella que sabe hablar, comprender, leer y escribir bien en dos idiomas				
16. La gente bilingue tipicamente habla un idioma major que el otro				
17. Los ninos pueden aprender dos idiomas al mismo tiempo				
18. Los ninos que aprenden mas de un idioma tienden a confundirse y mezclar los idiomas diferentes				
19. Cuando la gente bilingue mezcla los idiomas significa que no saben bien uno o ambos idiomas				
20. La gente bilingue se mueve de un idioma a otro sin esfuerzo dependiendo de la situacion y con quien se comunican				
21. En cada idioma, hay una forma estandar de ese idioma, la cual es la manera correcta de usar ese idioma				
10. Si la gente no usa la manera estandar de un idioma es por falta de educacion en ese idioma				
11. La gente use el language de manera intencional para mandar mensajes a determinadas audiencias y para reflejar quien son				
12. Las escuelas deberian ensenar la forma standard de los idiomas y no otras variedades				

Por favor marque la frecuencia con la que experimenta las siguientes situaciones:

	Nunca	*Algunas veces*	*Frecuente-mente*	*Siempre*
11. Mi hijo(a) interactúa con otros idiomas además del inglés en mi comunidad (por ejemplo, en periodicos, en la radio, en carteles)				
12. La gente en mi comunidad respeta y exhorta el uso de otros idiomas				

13. Mi hijo(a) interactua con otros idiomas ademas del ingles con parientes que no viven en nuestro hogar				
14. Nuestro parientes respetan y se exhortan entre si para aprender otros idiomas				
15. Me gustaria que mi hijo(a) aprendiera otros idiomas ademas del ingles en la escuela				
16. Las escuelas deberian ensenar otros idiomas ademas del ingles				
17. Le pido a mi hijo(a) que me hable en ingles				
18. Le pido a mi hijo(a) que me hable en otro idioma que no es el ingles				
19. Las comunidades deberían proveer información en idiomas multiples para asegurarse que todos tengan acceso a información importante				
20. Nuestra familia apoya el bilingualismo				

Por favor seleccione el idioma que su hijo(a) usa para las siguientes actividades:

	Ingles	*Otro idioma*	*Ambos*
Ver la tele o peliculas			
Escuchar musica			
Jugar			
Hablar con sus hermanos(as)			
Hablar con amigos			
Comunicarse en casa			
Comunicarse con parientes			
Usar en la escuela			
Otro: _____			

Informacion demográfica:

Escriba las palabras con las que se identifica:

Mi raza es _____

Mi etnicidad es _____

Sexo _____

Marque la informacion que major describe a usted y a su familia:

Tengo (18-25)____ (26-35) _____ (36-50) ____ (50+) ____ anos

Termine (el 12o. grado) ___ (Carrera de 2 anos) ___ (carrera de 4 anos) ____ (escuela graduada) ____

Nuestro salario se encuentra en ($0-$30,000) ____ ($30,000-$60,000)____ ($60,000-$100,000) ___ ($100,000+)

Si desea participar en una entrevista para hablar más sobre sus respuestas a este cuestionario, por favor contacte a Mariana Castro a mcastro@wisc.edu o al 608-239-1617.

Teacher Survey

This survey contains questions about you, your students and your school. The goal of this survey is to learn more about your beliefs about language and about the way your students and colleagues use language. Please answer as many questions as possible. The whole survey will take you approximately 15 minutes. No individual information that may identify you or individual answers will be shared with anyone. If you have any questions about this survey, please contact Mariana Castro at mcastro@wisc.edu or at (608) 239-1617.

Please answer the following questions:

11. What language(s) do you speak? _____
12. What language(s) do your students speak? _____
13. What language(s) are spoken in the community where you lived growing up?

    _____ where you live now? _____ where you work?

    _____
14. Does your school have a bilingual program? Yes___ No___

Please rate how much you agree or disagree with the following statements:

	Strongly disagree	Disagree	Agree	Strongly agree
22. People who speak more than one language have better opportunities for employment				
23. It is better to learn one language well before learning a second or third language				

24. Bilingual people are those who speak, read, write and comprehend two languages well				
25. Bilingual people are typically better at one language than the other				
26. Children can learn two language s at the same time				
27. Children who learn more than one language tend to get confused and mix the different languages they know				
28. When bilingual people mix languages, it means they are not yet fluent in one or both languages				
29. Bilingual people shift from one language to another effortlessly depending on the situation and with whom they communicate				
30. In every language, there is a standard form of that language, which is the correct way of using that language				
31. People don't use the standard form of a language because of lack of education about that language				
32. People use language intentionally to send messages to particular audiences and to reflect who they are				
33. Schools should teach the standard form of languages, and not other varieties				

Please rate the following statements based on the frequency in which you experience each situation:

	Never	Sometimes	Often	Always
21. I shift languages depending on the needs of my students				
22. My colleagues use students' native languages to enhance content learning				
23. Students are allowed to shift between languages or use a mixture of them to get their point across				
24. Students must use specific languages depending on the time of day				
25. Schools should include opportunities for teachers and students to think about the ways in which they use language(s)				
26. Schools should teach all children other languages in addition to English				
27. I ask my students to speak to me in English				
28. I ask my students to speak to me in a different language than English				

29. Communities should provide information in multiple languages to ensure all have access to important information				
30. Families should provide students opportunities to learn multiple languages				
31. Families of students learning English as an additional language should support their children by learning and using English at home				
32. The more time students learning English as an additional language spend in English environments, the faster they will learn English				

Please write any additional ideas you may have about language use in schools:

Demographic information:

Write in the words you use to identify yourself

My race is _____

My ethnicity is _____

I have been an educator (e.g. teacher, specialist, para professional, administrator) for ____ years