Inquiry into Co-Teaching:

Using Lesson Study to Develop More Collaborative Relationships

Between General Educators and Special Educators

Heather Thompson

Submitted in partial completion of

Reach Institute for School Leadership

Administrative Credential and Masters of Education

August 14, 2014

Abstract

Special education students often receive services through a resource model, in which the special educator provides support to students by pulling them out of class for remedial instruction or by pushing in to support individual students with classroom work. While this model provides some support to students, it does not provide them with full access to a coherent curriculum. To achieve this coherence, general education teachers and special education teachers must work together to collaboratively assess, plan for instruction, and teach. This action research project sought to increase collaboration between general education and special education teachers through an inquiry group lesson study process. The group, made up of six general education teachers and two special education teachers, collaboratively designed and implemented three co-taught CCSS math lessons. Each lesson study cycle consisted of planning meetings, a lesson observation, and a debrief meeting, for a total of 10 sessions. Data collected included pre- and post-surveys, meeting notes, transcripts of inquiry group meetings, and observation notes from the collaboratively designed lessons. All participants exhibited positive feelings towards the potential of co-teaching and collaborative planning, and some began to test out new instructional moves in their classrooms. However, the group had difficulty moving beyond already established practices, and many participants identified institutional factors that are currently preventing them from implementing a more collaborative model for serving special education students.

Introduction and Context

It's been transformational to have a space as a resource teacher to feel included and to have like these really important discussions about how we're supporting students. And it feels like there's some momentum for positive change because of that.
--Vanessa, K-4 Resource Teacher (May 7, 2014)

Eastside Community School is an urban charter school in the San Francisco Bay Area. Opened in 2002, the school serves about 750 students in grades K-12. About 75% of the students in the school are English Learners, 80% are low income, and 95% are students of color. About 5% of the students at the K-4 level receive special education services. For many years, the school was part of the city school district's Special Education Local Plan Area (SELPA). At the end of the last school year, Eastside made the transition to a new SELPA that serves many local charter schools.

I am a founding teacher at the school, having taught grades K-4 and served as a literacy specialist at various times over the past 12 years. Currently, I am a 3rd and 4th grade general education teacher, as well as an inquiry group leader and point person for Common Core Standards transition at the elementary level. Because of my role and my long tenure at the school, I have had many opportunities to observe and reflect on student achievement over time, as well as to serve as a sounding board for the concerns of other staff members.

Problem of practice

This year our school is in an important transition period in two major areas. First of all, we are making the transition to fully implementing the Common Core State Standards for Mathematics (CCSS). Secondly, the transition to the new SELPA brings with it many new Special Education staff members, as well as an opportunity to envision new possibilities for providing services to our students with special needs.

Although charter schools frequently have policies that "contribute to the exclusion of students with disabilities" (Shealey, Sparks & Thomas, 2012, p. 16), Eastside has not excluded students; this is in part because we have historically had strong, experienced special education teachers, and in part because of our belief in serving all students. Currently, students identified to receive special education services are provided their required hours of service through a hybrid pull-out push-in model. When students are pulled out of class, they are often provided with remedial skills-based instruction. During push-in times, the special education resource teacher helps identified students with whatever the classroom teacher is doing. These practices might be described as a "consultative" model for providing special education services, in which special education teachers provide one-on-one or small group support to students, while also providing occasional planning support to teachers. (Kilanowski-Press, Foote, & Rinaldo, 2010).

While this model provides students with extra support for basic skills, and also allows them to participate in classroom activities to a certain extent, it is not providing students with full access to the general instructional program. This is in part because the resource staff and the core teachers do not frequently collaborate around instruction—classroom lessons are planned by the core teacher, and the resource teacher often does not know what will happen until she arrives in the room. Similarly, pull-out lessons are planned by the resource teacher, and the core teacher often does not know what skills or strategies are being taught in those sessions. Additionally, new staff that have come on board after the SELPA transition are not trained in the pedagogical methods used by core Eastside teachers, or in methods for building conceptual understanding as required in the CCSS. This leads to a mismatch of instructional strategies between core classrooms and

resource classrooms. This mismatch is further exacerbated by the fact that resource teachers do not attend any of the same instructional training that core teachers attend, including the school's current work on understanding the CCSS for mathematics. Finally, the pull-out/push-in/hours of service model excludes many students who have significant learning needs, but did not qualify for special education services.

In the past few years as a classroom teacher, this problem has become increasingly apparent, especially this year: I have two students receiving significant services (8 hours and 4 hours per week), as well as three students who did not qualify for services but have significant learning needs. Conversations with other core teachers have shown that many of us are concerned that some of our students are not making the academic gains we believe could be possible for them if core teachers and resource teachers were better coordinating their services. In surveys taken prior to the beginning of this project, teachers noted that students with IEPs are often working a year or more below grade level in math, and lack foundational skills that would allow them to access grade level content. **Special education students and other students with learning difficulties are currently not receiving a coherent instructional program that gives them full access to the curriculum, based on the Common Core State Standards**. **To achieve this coherence, coordination between the core teaching staff and the special education staff is necessary.**

In order to address this problem, I created a theory of action and an intervention plan. After reviewing the literature on supporting students with special needs, co-teaching models, and lesson study as professional development, I developed and implemented a 10-session lesson study process that engaged general education and special education

teachers in an examination of co-teaching as a way to provide support for students with learning differences.

Literature Review

Introduction

Students with learning disabilities are among the most vulnerable of our student populations, and many schools fail to serve these students effectively. This is especially true of schools serving large numbers of students of color or low-income students. (Feldman, 2011.) Low-income students are most at risk of having both math and reading learning disabilities (Jordan, 2007), and there continues to be a mathematics achievement gap between white students and students of color (Royer and Walles, 2007). Instructional program coherence is a key lever for increasing student achievement (Newmann, Smith, Allensworth, & Bryk, 2001), and this coherence includes student support programs that "focus consistently on the school's instructional framework." (Newmann et al., 2001, p. 299).

In order for students with learning disabilities to receive a coherent math instructional program, special education teachers and general education teachers must have an understanding of both the general education curriculum and of challenges that students with learning disabilities face in accessing that curriculum. (Gersten, et al., 2009). Teachers must then work together to provide students with a coordinated instructional program that draws on best practices for math instruction in both general and special education. (Friend, Cook, Hurley-Chamberlain, & Shamberger, 2010). To work towards instructional coherence and more effective program coordination, teachers need a strong

professional community and focused professional development that allows them to critically examine their practice, make adjustments, and learn from practice (Podhorsky & Fisher, 2007; Hawley & Valli, 1999; Richardson, 2003). In the following section, I review the literature related to instructional program coherence as it supports math learning, models of special education service delivery, especially collaborative co-teaching, and lesson study as a model of inquiry-based professional development.

Math Learning and Program Coherence

The introduction of the Common Core State Standards for Mathematics (CCSSM) has led to important shifts in elementary math instruction in the areas of focus, coherence, and rigor. (achievethecore.org, 2014) The standards focus on fewer topics, but require more in depth coverage, as well as student understanding at the conceptual, procedural, and application levels. This means that teachers must deeply understand the content they teach, which is often not the case for elementary mathematics teachers (Gersten et al., 2009).

Research on math learning disabilities is limited (Mazzocco, 2007), but it is estimated that about 6% of students have a math learning disability (MLD), and up to 35% experience math difficulty (MD). While these two groups may be behaviorally similar in that they struggle to acquire key math concepts and skills, MLD has a biological basis, while MD does not. (Mazzoco, 2007). Students in both groups benefit from well-planned interventions and coherent instruction (Hecht, Vagi, &Torgeson, 2007; Gersten, et al, 2009).

In their review of the research on effective instructional interventions in elementary and middle school mathematics, Gersten, et al. (2009) note that "some interventionists may not fully understand the mathematical ideas that underlie some of the representations. This is likely to be particularly true for topics involving negative numbers, proportional reasoning, and interpretation of fractions" (p. 36). This may be a barrier to students with MLD receiving a coherent instructional program that includes support for conceptual as well as procedural understanding. Gersten, et al. recommend that interventions include explicit, systematic problem solving instruction, as well as opportunities for students to work with visual representations and explicitly transition from concrete to visual and abstract representations of key mathematical concepts.

Though much more research still needs to be done to illuminate both the basis for MLD and effective interventions (Mazzocco, 2007), a review of the literature seems to provide clear evidence that students need support in the area of number concepts, and that this support must include visual representations and problem solving support. This leaves open the question of how schools should provide these services. In many cases, the way a school structures services for students with learning disabilities may contribute to ongoing student failure, as "learning problems dwell in activities and cultural practices situated in the context of social relations." (Dudley-Maring, 2004, p. 482).

Many authors identify instructional program coherence as a key lever for increasing student achievement (e.g., Bryk, Sebring, Allensworth, Luppescu & Eaton, 2010; Newmann et al., 2001). Program coherence includes a common instructional framework, staff working conditions that support its implementation, and the allocation of resources to support the implementation of that coherent framework (Newmann et al., 2001). In

addition, “a coherent instructional guidance system also requires attention to the vast array of supplemental academic support programs common in urban schools. These programs demand coordination among themselves and with core classroom activities.” (Bryk et al., 2010, p. 205.) Without a coherent framework that includes attention to supplemental services, increasing learning for all students is not possible.

Instructional coherence seems to be particularly important for students in math (Oxley, 2008) because students need “recurring opportunities to practice and to apply knowledge and skills in new contexts.” (Newmann et al., 2001, p. 300). Coherence may also increase student motivation and willingness to attempt challenging tasks as they see that learning experiences are connected and driving towards a larger goal. (Newmann, et al., 2001). As such, a coherent curriculum provides “a rigorous learning experience to students at all levels of academic achievement,” (Oxley, 2008, p. 5), including special education students and struggling learners, who are often without essential supports in math classrooms and therefore don’t have access to the curriculum (Treahey & Gurganus, 2010).

Achieving instructional coherence can be challenging, as schools balance competing demands for resources and learning outcomes. This can lead to “distinct program interventions for each group or problem…reinforced by staff specialization and by categorical funding aimed at special groups or problems,” making it “difficult for teachers to work from a common instructional framework.” (Newman, et al, 2001, p. 314). To combat this challenge and achieve coherence, schools must work in interdisciplinary teams that include both core content and special education teachers (Oxley, 2008).

Co-teaching as a preferred model for delivering special education services

In an effort to improve services for students in special education programs, many schools have moved to inclusion or push-in service models. This has been prompted in part by the No Child Left Behind Act (NCLB), which set a high standard for the expected achievement of students in special education programs, and the 2004 reauthorization of IDEA, which indicated that the preferred placement for students with disabilities is almost always in the general education classroom (Kilanowksi-Press, et al., 2010; Magiera, et al., 2006). Despite this move toward more inclusive placements, most students in special education programs are still not achieving at the level of their grade-level peers (McClesky & Waldron, 2011).

"Inclusion" is a blanket term used to describe many different types of services delivered to students with disabilities within a general education classroom (Kilanowski-Press, et al., 2010). While co-teaching (defined and discussed further below) is seen by many as the preferred model for providing services in an inclusion environment, in their study of teachers in New York State, Kilanowski-Press, Foote, and Rinaldo (2010) found that "co-teaching…is the least employed avenue for inclusive instruction as reported by teachers" (p. 53). Instead, most teachers employed a consultative model, in which a special educator provided indirect support for planning or pushed in to the classroom to work one-on-one with students, but remained an "ancillary presence" (p. 55) in the classroom.

Many researchers have noted that while there is much research about teacher perception of inclusion or co-teaching models, there is little empirical evidence about the efficacy of such programs in supporting student achievement for students with disabilities (e.g., Friend, et al., 2010; Kilanowski, Foote and Rinaldo, 2010). However, there is also little

evidence that pull-out or resource placements are any better (McCleskey & Waldron, 2011). McCleskey & Waldron (2011) reviewed eight studies of inclusion programs, and found that while some students in inclusion classes made significant progress, the majority made very little, and generally not as much progress as their grade-level peers. In the studies reviewed, students with learning disabilities (LD) were more likely to make gains similar to general education students in reading than in math, but "most students with LD who were served in full inclusion settings did not make significant progress to catch up with peers and meet grade level benchmarks" (p. 20). Though, as Friend, et al. (2010) point out, this may be due not only to program design, but also to a lack of teacher training.

However, some studies have shown that students can be served effectively in inclusion settings. Comparison data from two middle schools, one of which served students in an inclusion setting and one of which had a resource program, showed that students in the inclusion setting performed similarly to resource students on some measures, and better on others, including classroom grades and standardized math test scores. Factors that may have contributed to this outcome included more focused IEP goals, more accommodations, and more contact time with special educators (Rea, McLaughlin, & Walther-Thomas, 2002). In another study of several schools in one district, Hang & Rabren (2009) found that students with disabilities who had been in co-taught classrooms for one year performed significantly better on a standardized test measure than they had before they were co-taught. In addition, all participant groups, students, general education teachers, and special education teachers, perceived that students had more support and had improved their academic achievement.

As Rea, McLaughlin, & Walther-Thomas (2002) point out, much of the debate about the optimum service delivery model for students with learning disabilities "hinges on the lack of empirical evidence" (p. 204). More study of program efficacy is needed, and until then most decisions about placement and services are based on the philosophical belief that students with disabilities should interact with non-disabled peers. (Friend, et al., 2010).

Even McCleskey & Waldron (2011), who found that inclusion programs often do not narrow the achievement gap, warn that their findings are "not an indictment of inclusion in general" (p. 22). Instead, they conclude that:

> The best educational setting for most students with learning disabilities is a well-designed inclusive program, supplemented as needed by short-term, intensive, small group instruction in a separate setting…the difficulty that lies ahead is determining *how* to ensure that these practices are used in schools, given the poor instruction and student outcomes that have been typical of resource settings…what this research suggests is that we have failed in all too many instances to ensure that the programs we provide for students with learning disabilities are *both* inclusive and effective. (p. 22)

Scruggs, Mastropieri, & McDuffie (2007) agree, concluding in their metasynthesis of the qualitative research on co-teaching that "the co-teaching model of instruction is apparently being employed far less effectively than is possible…students with special needs are receiving good general education instruction, with assistance, but are [not] receiving a *special* education." (p. 411).

Much of the recent research on inclusion settings focuses on the co-teaching model, which is designed to provide students with disabilities with specialized instruction while at the same time including them in the general education environment (Friend, et al., 2010). Co-teaching is defined as a collaboration between a general education teacher and a special education teacher, in which both teachers share responsibility for planning, delivering, and

assessing instruction for a diverse group of students, including students with and without disabilities (Treahy & Gurganus, 2010; Friend, et al., 2010). A key feature of co-teaching is that "teachers are equal professional partners in the classroom and are responsible for the entire group of students." (Treahy & Gurganus, 2010, p. 485.) This partnership may take many forms, including team teaching, station teaching, parallel teaching, alternative teaching, one teach one assist, and one teach one observe (Friend, et al., 2010).

In most cases, however, teachers in co-taught classrooms are *not* equal partners in instruction. The "one teach, one assist" model is the most prevalent model, with special education teachers often taking the lower status role of assistant (Scruggs, et al., 2007). Because of this, the potential inherent in the model, including smaller student teacher ratio and access to specialized instruction for students with disabilities, is not realized. (Friend, et al., 2010).

Many studies regarding teacher perception of co-teaching models have been conducted, and several factors for effective co-teaching have been identified. Among these are adequate professional development for teachers, time for co-planning and assessment, relationship building and communication among co-teachers, and teacher involvement in the change process. (Magiera, et al., 2006; Treahy & Gurganus, 2010).

There are many potential benefits to students when co-teaching models are fully implemented. Lower student teacher ratio, essential academic supports for struggling students, and the social benefits of peer models for students with disabilities are often cited (Scruggs, Mastropierei, & McDuffie, 2007). Team teaching can maximize the curriculum expertise of the general educator, while at the same time drawing on the expertise of the

special educator in terms of individualized learning. Such a collaboration benefits all students in the classroom. (Friend et al., 2010).

In order to fully implement a co-teaching model, all teachers must have high-quality professional development that develops both their content knowledge and their instructional skills to support students with disabilities. "And, although it seems obvious, the importance of teaching partners together participating in this professional development cannot be overemphasized." (Friend, et al., 2010.)

Lesson study as professional development model

Many would agree that a collaborative professional development process is essential to implementing change in a school. A community of practice is defined in part by co-participation, with the learning occurring the relationships between people (Smith, 2003). Each professional community has its own established culture (Schein, 2004), and within that community "daily practice is a complex, collectively negotiated response to…the situation" (Wenger, 1998).

Professional development, then, must build upon and strengthen the community, allowing teachers to construct knowledge interdependently (Hollins, 2008). Characteristics of effective professional development include focus on goals, student thinking, and student performance, teacher involvement, a collaborative problem solving environment, and a continuous and supportive process with a positive, learning orientation. (Hawley & Valli, 1999; Schein, 2004).

In addition, a change process is likely to be successful only if the group's work results in some success (Schein, 2004), and if the learning activities are focused and

prioritized (Podhorsky & Fisher, 2007) and have coherence across programs and activities (Opfer & Pedder, 2011). Effective professional communities also have a sustained focus, collective participation, and attention on student learning (Little, 2006).

An inquiry approach is one professional development method that engages teachers in a focused, collaborative process to examine student learning. In an inquiry approach, "participants determine their individual and collective goals, experiment with practices, and engage in open and trusting dialogue about teaching and learning with colleagues." (Richardson, 2003, p. 402). This approach requires that teachers share professional dilemmas, and value and participate in in-depth discussion, even when it leads to conflict (Little, 2006). Through a cyclic process of inquiry and reflection, "changes in beliefs lead to changes in practice that bring changes in student learning that bring further changes in practice that result in additional changes in belief and so on" (Opfer & Pedder, 2011).

If in fact systematic attention to learning and thinking is a key feature of a professional teacher community (Little, 2006), then a lesson study process can be a key lever for school change (Perry & Lewis, 2009; Podhorsky & Fisher, 2007). Lesson study is a process through which teachers "work together to plan, teach, and observe a cooperatively designed lesson" (Podhorsky & Fisher, 2007). As the lesson is implemented, the observers take notes on student understanding. Then this data is used to inform future planning, either revision of that lesson or planning of a new lesson. Through this lesson design and observation process, teachers examine their instructional practice and find ways to plan for and meet the needs of all students. The goal of lesson study is not to create perfect lessons, but to create a climate in which teachers can engage in deep discussion about instructional practice (Lewis, Perry, Hurd, & O'Connell, 2006; Podhorsky & Fisher, 2007).

Case studies of one school district that implemented lesson study found that the process prompted teachers to have insight into the experiences of different learners and analyze the barriers and supports to student learning (Hurd & Licciardo-Musso, 2005). Lesson study also supported trusting relationships among staff, and encouraged teachers to push one another's thinking (Lewis, et al., 2006). In this school, teachers began to view lesson study as a process for instructional improvement because of the use of reflection, use of protocols and tools, access to outside knowledge sources, and increases focus on student thinking (Perry & Lewis, 2009). Lesson study may also lead to increased coherence across classrooms as teachers learn from each other and conduct shared investigations (Lewis, et al., 2006).

In another school, teachers identified the emphasis on planning lessons that meet student needs, the inquiry focus, the increased reflection on teaching practices, and the strengthened professional relationships as strengths of the lesson study model. In this school, lesson study was part of a school reform effort, and may have contributed to significant math achievement gains over a six-year period (Podhorsky & Fisher, 2007).

Perry and Lewis (2009) found that conditions for effective lesson study included learning opportunities, professional community with diverse and changing group membership of both experienced and novice teachers, distributed teacher leadership, and access to resources, both knowledge resources and financial resources. Additionally, the lesson study process must serve the school's work, and the school must have a learning stance, or the expectation that teachers will continue to learn about content and teaching (Lewis et al, 2006). If these conditions are in place,

> Lesson study as a professional development process can build capacity of all teachers. It is through collegial conversations and lesson study groups that teachers

> can begin to develop a critical examination of their instructional practices. Through lesson study, the culture of schooling can change. (Podhorsky & Fisher, 2007, p. 455.)

Building on three lessons that Lewis, et al. (2006) learned from teachers in their case study, I created a theory of action. Through a lesson study process, teachers would be encouraged to take a learning stance, growing their knowledge about both math pedagogy and supporting students with learning difficulty. By providing teachers with a structure, co-teaching, I would support the group to access external knowledge of best practice in special education, and then gradually move to internal ownership of the collaborative work necessary to make co-teaching possible. In doing this, we would further refine and contribute to the school's mission of providing all students with rigorous learning experiences.

Theory of Action			
Challenge/ Problem	Literature Review	Intervention/ Innovation	Expected Change
Special education students are currently not receiving a coherent instructional program that gives them full access to the curriculum, based on the Common Core State Standards. • Resource staff and core staff not receiving same professional development • Time not allotted for resource/core collaboration • Different instruction for students in resource pull-out than in general education curriculum	• Achievement gap in special education • Math learning and instructional program coherence • Co-teaching models • Lesson study as professional development	• 10 session lesson-study cycle with 6 general education and 2 resource teachers • Collaboratively select a co-teaching model and design a lesson to be co-taught by a gen. ed. and resource teacher • 2 model lessons, eachh implemented in 2 classrooms, with an iterative process of observing, sharing data and debriefing, and revising the lesson over the course of 4 weeks	• increased collaboration between core and resource staff • core teachers will learn new instructional practices to support students who have learning disabilities • resource teachers gain an understanding of math pedagogy being used in core classrooms • special education students participate fully in lesson study lesson and in other classroom math lessons • increased understanding of and support for co-teaching as a way to support special education students and other struggling students.

Intervention design

As a way to facilitate the growth of shared understanding and collaboration between general education and special education teachers, I designed a semester-long, 10-session lesson study process, in which classroom teachers and resource teachers would collaboratively design and implement math lessons based on the CCSS. The lesson study group included all third through sixth grade math teachers, as well as the two resource teachers that work with those grade levels. Participants included:

- Roxy, a 6th grade math teacher with 10 years of teaching experience
- Erika, a 5th grade math teacher with 17 years of teaching experience, who was also a founding teacher at the school; also the only teacher in the group who had previous experience with co-teaching
- Jennifer, a 5/6 resource teacher, who is in her first year of teaching
- Zoe, a 4th grade teacher with 11 years of teaching experience,
- Jason, a 3rd grade teacher with 9 years of teaching experience
- Claire, a 3rd grade teacher with 4 years of teaching experience, who was new to the school this year
- Vanessa, a K-4 resource teacher, with 10 years teaching experience (7 in classroom and 3 as an resource teacher)
- Heather (the researcher), a 4th grade teacher, with 16 years of teaching experience, including as a founding teacher at the school.

It is important to note that both Roxy and Vanessa had been on maternity leave first semester and returned to work on the same day as the first inquiry group session.

The general education teachers in the group had investigated the big ideas of the Number and Operations: Fractions strand of the CCSS during their first semester inquiry group work. During this new inquiry group cycle, all 8 teachers first learned about various co-teaching models by reading a short article about co-teaching in the mathematics classroom; they then collaboratively designed a math lesson. The lesson was designed with a specific focus on supporting all students to build conceptual understanding, and was co-taught in the general education classroom by a classroom teacher and a resource specialist. (The co-teaching model to be used for the lesson was selected by the group after discussing the reading in the initial inquiry group meeting.) After the lesson was implemented, the group shared observations of impact on both general education and special education students, and engaged in an iterative process of revising and implementing the lesson in other classrooms.

This lesson study built on the success of a previous lesson study cycle implemented by the inquiry group I lead. During the 2012-13 school year Zoe, Jason and I, along with a language development specialist and a teacher who is no longer at the school, engaged in a lesson study cycle designed to help us learn about supporting English language learners with the CCSS math practices. However, as mentioned above, resource specialists were not part of this group. In constructing the lesson study group for this year, I chose to include resource teachers because the lesson study process provides an authentic way for teachers to build both content and pedagogical knowledge in a collaborative environment. (Hurd & Licciardo-Musso, 2005).

Based on the literature and on our previous success with lesson study, I believed that engaging in a shared lesson study process would have a significant impact on core

teachers, resource teachers, and students. For core teachers, this process would help illuminate ways in which we could be planning daily instruction to better meet the needs of all of our students. Resource teachers would gain a better understanding of the instructional practices in use in core classrooms, and both groups of teachers would have an opportunity to collaborate more closely on instructional design. As a result of this collaboration in the lesson study process, stronger relationships between core teachers and resource teachers would form, which would lead to greater collaboration outside the lesson study group. This collaboration would in turn benefit students, who would begin to receive a more coherent instructional program in math as core teachers took on some of the practices of the resource teachers and vice-versa. Over time, this newly collaborative relationship between core and resource teachers would open up possibilities in terms of the structures used to support special education students and other students with learning difficulty school-wide, including a move towards more co-teaching in the general education classroom.

Intervention action plan

	Component	Activities	Purpose	Data to be Collected	Type of Data
1	Inquiry Group Meeting 1 (1/6)	Set goals and norms Read and discuss article about co-teaching models: Treahy, D. L., & Gurganus, S.P. (2010). Models for Special Needs Students: Teachers describe five proven, effective co-teaching strategies for collaborative partnerships with special education instructors and other professionals. *Teaching Children Mathematics*, April 2010, 484-490. Conceptual understanding of adding/subtracting fractions activity	Create shared understanding of co-teaching as an instructional model; build excitement, build trust and collegiality Shared experience of math with new group members	Audio Pre-survey Meeting agenda and notes Researcher field journal	Process impact
2	IG Meeting 2 (1/15)	Collaboratively plan first research lesson (Goal of research lesson: What instructional practices give ALL students access to conceptual math understanding?)	Build trust and collegiality, create lesson based on current shared understanding of best practices to support all students	Audio Researcher field journal Meeting agenda and notes	Process impact
3	Lesson observation A (1/29)	Teach and observe research lesson	Observe lesson implementation; focus on student thinking during the lesson, collect low-inference data about instructional practices	Researcher field journal	Process impact

4	IG Meeting 3 (1/29)	Analyze data from lesson observation A, brainstorm revisions	Use lesson data to inform instructional decisions, begin to draw conclusions about which instructional strategies seem to support all students to gain conceptual understanding in math	Audio Researcher field journal Meeting agenda and notes	Process impact
5	IG meeting 4 (2/12)	Revise lesson	Build trust and collegiality, create lesson based on current shared understanding of best practices to support all students	Audio Researcher field journal	Process impact
6	Lesson observation B (2/26)	Teach and observe research lesson	Observe lesson implementation; focus on student thinking during the lesson, collect low-inference data about instructional practices	Researcher field journal	Process impact
7	IG meeting 5 (2/26)	Analyze data from lesson observation B Synthesize take-aways from first research lesson --math take-aways --co-teaching take-aways (What instructional practices give ALL students access to conceptual math understanding?)	Use lesson data to inform instructional decisions, begin to draw conclusions about which instructional strategies seem to support all students to gain conceptual understanding in math	Audio Researcher field journal Meeting agenda and notes	Process impact

8	IG Meeting 6 (3/12)	Plan new research lesson	Build trust and collegiality, create lesson based on current shared understanding of best practices to support all students	Audio Researcher field journal Meeting agenda and notes	Process impact
9	Lesson observation C (Week of 3/17)	Teach and observe research lesson	Observe lesson implementation; focus on student thinking during the lesson, collect low-inference data about instructional practices	Researcher field journal	Process impact
10	IG Meeting 7 (Week of 3/24)	Analyze data from lesson observation C, brainstorm revisions	Use lesson data to inform instructional decisions, begin to draw conclusions about which instructional strategies seem to support all students to gain conceptual understanding in math	Audio Researcher field journal Meeting agenda and notes	Process impact
11	IG meeting 8 (April)	Revise lesson	Build trust and collegiality, create lesson based on current shared understanding of best practices to support all students	Audio Researcher field journal Meeting agenda and notes	Process impact
12	Lesson observation D	Teach and observe research lesson	Observe lesson implementation; focus on student thinking, collect low-inference data about instructional practices	Researcher field journal	Process impact

13	IG meeting 9 (April)	Analyze data from lesson observation D Synthesize take-aways from second research lesson --math take-aways --co-teaching take-aways (What instructional practices give ALL students access to conceptual math understanding?)	Use lesson data to inform instructional decisions, begin to draw conclusions about which instructional strategies seem to support all students to gain conceptual understanding in math Name key take-aways and implications for future instruction	Audio Researcher field journal Meeting agenda and notes	Process impact
14	IG meeting 10 (April)	Process reflection, next steps, and celebration	Debrief process, revisit idea of co-teaching Create presentation to share our experience with rest of staff	Post-survey Audio Researcher field journal Meeting agenda and notes	Process Impact

Research methods

The intervention was carried out according to the intervention action plan detailed above, with a few alterations based on the needs of the group. The most significant alteration to the plan was the allowance of two planning sessions prior to implementing the first research lesson, and two planning sessions prior to the third research lesson. This was based on feedback from the group that we needed more time to adequately plan. Dates of research lessons were adjusted accordingly, but we were only able to implement three research lessons rather than four. One of these lessons took place in a sixth grade classroom, one in a fourth grade classroom, and one in a third grade classroom to provide participants with experiences that matched all grades represented in the group.

There were two types of inquiry group meetings: planning and reflection. Both meetings typically began with an opening check-in and ended with a round of appreciations or final thoughts. Planning meetings included a review of the goals, discussion of the structure of the lesson, and either whole group or small group planning time. Reflection meetings followed a structured protocol: one round for low-inference data, one round for interpretations, one round for implications, and then "spirited discussion," an open discussion round which typically went on for 10 or 15 minutes. All meetings were audio recorded and transcribed. (See Appendix A for sample meeting agendas.)

During each research lessons, all participants took notes on the actions of a specific person, either a student or a teacher, assigned to them by the group. I took notes as a participant, but also took more general notes about the process and overall observations in my researcher's journal. While I had initially intended to videotape all research lessons,

that was impractical for logistical reasons, so data regarding research lessons is based on my own notes and recollections of participants during reflection meetings.

Participants in this study included teachers who would typically be part of our inquiry group, and all participants agreed to be part of the study. Our school's Director of Instruction, Paula, was also present at some group meetings and consented to be part of the study as well. In addition to sharing their insights during inquiry group meetings, all teachers responded to a pre- and post-survey. (Survey questions are detailed in Appendix B.) The pre-survey was administered at the very beginning of the first inquiry group meeting, and the post-survey was completed by teachers in the weeks following the final meeting. Though I did not conduct any formal interviews with participants, I did keep notes of informal conversations relating to the study as they arose throughout the semester, and, as it turned out, into the summer.

Data analysis methods

All inquiry group meetings were transcribed, analyzed for relevance, and coded. (Because of the nature of group meetings, large sections of the meeting were sometimes not relevant to the study and were therefore not coded.) This data was of two types: statements made by individual teachers and exchanges between teachers. All responses from the pre- and post- surveys were also coded, as were notes from my researcher's journal. Coded data was entered into a spreadsheet noting the data source, code, and participant. Statements and exchanges were coded multiple times if they related to multiple themes or multiple participants. Initial codes were based on the expected

outcomes from my theory of action, but as I transcribed tapes and reviewed survey data, significant new themes appeared and were coded as well.

After coding, data was sorted both by theme and by participant and reviewed to determine significant patterns. Findings were considered to be strong when supported by multiple sources of evidence across multiple participants.

Data analysis findings

Special education students and other students with learning difficulties were not receiving a coherent instructional program that gave them full access to the curriculum, based on the Common Core State Standards. Because collaboration between special education and general education staff would be necessary to change this, the third through sixth grade math teachers and resource teachers participated in a lesson study group. Through participating in this group, I theorized that general education and special education teachers would develop more collaborative relationships. All teachers would learn new instructional practices, and the group would develop an understanding of co-teaching models and support an instructional shift towards inclusion and co-teaching.

Overview of findings

After participating in the lesson study cycle, some teachers did show signs of increased collaboration with colleagues, both within and outside the lesson study group. In addition, many teachers began to view their role in an expanded manner, seeing themselves as more fully responsible for more students. While the group spent a lot of time discussing mathematics and mathematics pedagogy, it is unclear how much change

individual teachers made in this area. Teachers identified both instructional tools and structural supports that might benefit students with learning difficulties. Teachers expressed positive attitudes towards inclusion and co-teaching, but felt that institutional factors might make implementing a more inclusive co-teaching model difficult. In fact, the lesson study group had difficulty innovating on the preferred co-teaching model (small group instruction) that most closely matched our existing practice. Despite this, at the end of the lesson study cycle all group members expressed a desire for a change in the way we serve special education students and other students with learning difficulties and three group members are now involved in a co-teaching pilot project for the 2014-15 school year.

Collaboration during inquiry group

Throughout the lesson study process, general education and special education teachers collaborated to design research lessons and analyze the results. All seven teachers participated actively in this process. All teachers were a part of discussions about general math pedagogy, as well as supports that might be put in place to help struggling students. (An example of a typical conversation is included in Appendix C.)

While I had initially hypothesized that resource teachers would learn new math pedagogies and general education teachers would learn new supports for students, in fact the exchange of ideas was more fluid. Resource teachers did sometimes push the group to consider the learning of each student, as Jennifer did on January 29 when she said, “Are we teaching strategies for how to estimate? Or are we assuming they’ll just pick up on it? Because I think some kids won’t pick up on it.” But they also helped move the group

forward in thinking about general math pedagogy, as when Vanessa suggested "You know what a good pre-step to that is then Claire, is make different number lines that equal a whole…don't always make the one the same size. Sometimes make your one this big, sometimes make it this big…"

As the math pedagogy at the heart of the lesson study, conceptual understanding of fractions, was somewhat unfamiliar to many teachers in the group, the group relied most heavily on Erika, the general education teacher with the most experience, to answer questions and provide direction. In all five planning meetings, she urged the group to leave discussions open-ended and helped the group in solidifying the use of a number line model. In discussions during sessions 9 and 10 as well as the post-survey, participants (both general educators and special educators) also mentioned use of formative assessment, careful structuring and scaffolding of problems, and use of error analysis with students as key learning from the inquiry group process. This breadth of instructional conversation and differentiated take-aways is in keeping with the goal of lesson study as stated by Lewis, et al. (2006), which is not to have a perfect lesson but, rather, to create a climate for rich discussions about teaching and learning.

Collaboration beyond the group

There is some evidence that, over the course of the semester, special educators and general educators began to shift their collaboration during the course of their daily work. In their initial survey, the 5th and 6th grade teachers noted that they had not been having collaboration meetings between the general education and resource teachers. At the end of the semester, Erika reported, "I've started collaborating with my resource teacher this

semester! Meeting regularly." Jennifer noted that they were doing "kid talk—we discuss specific students and how they are doing. The core teacher also fills me in briefly on what the students will be doing in math that week." However, because Jennifer was new to the school and to teaching first semester, it could be that this collaboration would have improved during the second semester even without the influence of inquiry group, as Jennifer became more adept at managing her schedule and the team got to know each other.

At the 3/4 level, where teachers were generally more experienced and all but one team member had worked together previously, there was also evidence that the general education teachers and Vanessa were beginning to collaborate differently. Institutional factors—Vanessa was on maternity leave and her substitute was unfamiliar with Eastside pedagogy—had meant that during the fall, the 3/4 general education teachers had collaborated with the resource teacher only on a surface level. Claire in particular was eager to change that, and she and Vanessa both told the group about their work together, for example:

> Vanessa: But there have been a couple times when I've been in Claire's room and it's been cool, she's been like, oh, Ms. Johnson [Vanessa], will you come show us this thing that you were just showing this student. I feel like I'm still looking for the classroom teacher to signal to me that they want that more, but I think I'm still hesitant to just jump in.
>
> Claire: Well, and I think like recently, it's just been nice, because we've been doing exactly what you guys have been working on, and it's been really exciting for Alex. I took a picture of him by the way, that I wanted to share with you, of him using his little strategy card, like organically, I walked by and he was working with his little strategy card there, and I was like, can I take a picture to show Ms. Johnson?
>
> Vanessa: Thank you. (May 7).

Zoe noted how she and I began using our collaborative planning time with Vanessa more deliberately:

> Heather, Vanessa, and I have been trying something that's similar to that. So on Tuesday and Thursday we have math workshop, and we're re-teaching the four operations, so there's like some general mini-lesson, and then, um, I send some kids to Heather, Heather sends some kids to me, and then Vanessa has her intervention kids [some with IEPs and some without]…

Negotiating Roles to take responsibility for all students

Vanessa working with students who did not have IEPs as part of the 4th grade math workshop time indicated that she had begun to shift her thinking about which students she was responsible for serving during her classroom push-in times. Throughout the process, Vanessa had identified a tension that she felt as a resource teacher in negotiating her responsibility to students with IEPs and her responsibility to other students in the class. "[I] think, is this helping this IEP student if that is my purpose in being here? Um, because I also really love the vision and model of everyone benefits from having an extra teacher in the room, but I feel, a commitment I guess, a necessity that ultimately I have to help that student." (January 6). As we planned and reflected on lessons in the inquiry group, Vanessa continued to bring up this tension, for example in this exchange with our director of instruction on March 26:

> Paula: I think that's what the spirit of, even how we're envisioning RSP services, right, I know that with, one of the visions for this year was to pull in students even if they're not IEP into the support groups if needed, right, so I can think of 3rd graders and even of our first grader this morning, students that aren't labeled IEP, but that we know need additional support, so pulling them into existing groups.
>
> Vanessa: And in those groups we need to make sure that the students who have IEPs, that those groupings work for those students.
>
> Paula: Right.

> Vanessa: Because what's been happening is that those groupings don't work for those students all the time, and then those students with IEPs aren't getting their needs met. And so yes, I completely agree with that vision, when the needs are concurrent.
>
> Paula: Match, mm hmm.
>
> Vanessa: But when the needs aren't concurrent, and the IEP student then isn't served, I have to like red light, right, because then we need a second person, or a second time, or a second round or more staffing, or more flexible grouping or something, but sometimes, sometimes that will overlap and sometimes it just won't.

However, later in the semester, Vanessa began to expand her idea of the resource teacher's role, suggesting at one point that the resource teacher might support other students while the classroom teacher works with those who are struggling most, advocating for the school to explicitly provide services to students without IEPs, and saying in our final meeting and on her post-survey that one of her take-aways is that she could work with more students: "I could work with more kids. I could work with other kids that don't have IEPs during push-ins. Not always, but usually."

Similarly, there is some evidence that general education teachers began to think more carefully about the support they provided students with IEPs. All the general education teachers had already stated in their pre-survey that it was their responsibility to support students and differentiate instruction, but over the course of the intervention teachers stated more specifically what they might do, for example making sure all students were engaged in class discussions, providing tools, using ongoing assessment to create groups, and modifying assignments (with the help of the resource teacher). Teachers also began to discuss affective factors that might influence children's learning, such as Erika's suggestion that we ought to be "creating this culture where you know, groups are kind of flexible and moving, so even though we do may decide to put the kids in three groups,

during the lesson we might, you know, nudge them to go off, so we also don't feel like it's fixed because I think that can also be limiting."

Two general education teachers explicitly named this shift to more flexible thinking about teacher roles in their post-surveys. In January, Erika had identified both the general education and special education teacher's roles in supporting students with IEPs as primarily goal setting and tracking. In May, she wrote that teachers "should be collaborating…to create a long term plan, activities, assessments, and other curriculum resources to support students." In other words, both groups of teachers have a "significant role" in daily instruction.

Zoe exhibited this shift as well. In January, she defined the resource teacher's role primarily as a supporting role, writing that "the resource teacher's role is to provide support to both the classroom teacher and the student to help them access content." In May, when asked to define the resource teacher's role, she responded: "I actually think it's the same as the gen ed teacher's role."

It could be that, as teachers began to carefully examine the learning of behaviors of all students in the classroom, teachers had perhaps come to recognize, as Friend, et al. theorize, that "two systems—general education and special education—may not work in the best interest of maximizing student achievement and other outcomes. The implications of this transition toward more collaborative and inclusive practices are far-reaching." (p. 23.) In other words, if we wish to serve all students well, then each of us must serve all students.

Attitudes towards inclusion and co-teaching

While all teachers expressed positive feelings about both inclusion and co-teaching at the beginning of the study, there were two teachers who initially viewed the resource role as primarily a pull-out support role. Both of these teachers exhibited a clear shift towards viewing resource services as more collaborative and integrated with daily work inside classrooms.

At the beginning of the semester, Jennifer characterized her work as a resource teacher primarily in terms of pull-out remediation. But at the end of the inquiry group process, she reflected in her post-survey that

> we need to do more work towards providing strong supports within the classroom for students who struggle. The best option would be to keep all students in the classroom, so instead of turning to resource pull-out as the answer, I think that we need to focus more on scaffolding and accommodating within the core class—especially for students without IEPs who need support.

Similarly, Jason, who at the beginning of the semester felt that students who were having a hard time with math needed re-teaching and review in small group settings, reflected:

> This semester's inquiry group cycle has helped me think more broadly and flexibly about what the resource teacher can be doing to provide support to students and teachers: both who should receive services and how they should be administered.

Jason also exhibited a significant shift in his beliefs about co-teaching, which will be discussed in more detail below.

As part of the planning process, the group spent a significant amount of time looking at student pre-assessments to determine which students would need support with particular concepts. Often, this group involved students who had IEPs, but also students who were not receiving special education services. General education teachers in particular

felt, as Jason said, that, "maybe the work of inquiry group is to find out how to expand the resource teacher's reach to not just the two kids with IEPs, but maybe, those two kids with IEPs, and those few others who need similar support." This idea is an important tenet of co-teaching as a way to provide special education services (Scruggs, et al., 2007). Consequently, students both with and without IEPS were included in all of the support groupings during research lessons.

While both resource teachers felt that this was an important shift in how we serve students, they also both expressed concern that when students with IEPs are at a very different level than their peers, including other students might be difficult. This concern arose especially after the second research lesson, in which the student who had the most comprehensive IEP was the least successful out of all the students explicitly supported during the lesson. This idea of the balance between meeting the needs of students with IEPs, especially when they were academically very far behind, and meeting the needs of other students arose again and again, and was never fully resolved.

It may be that general education and resource teachers continued to differ in their analysis of who should receive services because of the difference in the way their roles are currently constructed—general education teachers are explicitly responsible for every student, while special education teachers have a legal responsibility to provide certain services to students with IEPs. The "blurring of traditional boundaries" (Friend, et al., 2010 p. 23) represented by co-teaching therefore presents a very real, practical challenge for special education teachers. However, the mixed results of the research lessons (discussed in greater detail below), led some teachers to question the way we provided service even to students who do have IEPs:

> I'm thinking/wondering about what the resource teacher's role in the classroom is when they provide support. It seems that what it often looks like is the resource teacher is coaching the student through the work and helping them finish it. That's not to say that it's not valuable for the students to get support with that, but I'm not sure that's what is really needed, especially for students who are so far behind -- is it really the best use of anyone's time to just make sure that the student finishes the assignment, especially if they can't apply what they've done that day towards future assignments? For me, I think something I need to think about more when I work with the resource teacher is setting a clear goal for that student in terms of what I want them to accomplish during their push in time. (Zoe, post-survey)

And to reflect on what it really means to meet all students where they are:

> Roxy: I've been just reminded of over and over since I've been back this year is that I really need to be teaching with where they're at and not where I want them to be at 6th grade.
>
> …
>
> Paula: Roxy I was thinking about what you said about meeting them where they're at, and where they're at is in so many different places.
>
> Vanessa: That's true.
>
> Claire: That's true.
>
> Roxy: Like some of them are ready for, and some are way behind.
>
> Erika: We also can't, like these kids, we gotta, we also have to serve them, too.
>
> Paula: So it means that things are going to look very different in the classroom, people are going to be doing very different things. (February 12)

As mentioned above, the group spent a lot of time during the final inquiry group sessions discussing what it means for students to be in very different places and the importance of serving students as part of the general classroom community rather than in pull-out groups or in small groups that are isolated within the classroom. Jason worried that being constantly pulled out could be stigmatizing, and the group returned again and

again to whether small group or one-on-one support was preferable. As Vanessa and Roxy noted,

> Vanessa: There's a reason why the federal law moved towards inclusion, right. Like there's a real reason why like kids should be included. And even the way we do pull-out…is counterproductive to what we know about what serves kids best. And kids with special needs best. Like I feel tension every time I pull a kid out of a room. And kids'll tell me. There's a reason kids get pissed! Because they're like, I just got settled, or I was in a groove, or like, I really want to be a part of this thing actually, and you can't do it all before school, and you can't take away their times that they love like art and music, and kids get pissed at me, for good reason…I feel horrible sometimes having to pull kids out of their classroom. I'm like, here we go, let's go.
>
> Roxy: And having those groups happening in the classroom, like, speaking as a general ed teacher, will only make me a better teacher, because I'm gonna be really thinking about, there's these kids that I know need something, but it's probably going to help out the rest of the kids if I'm thinking about those modifications in this lesson. (May 7)

As is evident from Roxy's comment, from the beginning of the project, all teachers saw the potential inherent in having two teachers in the classroom during key instructional times. Erika noted in our initial meeting, "What those kids could do with two adults fully responsible for all the kids is pretty amazing. So I'm excited that we might get to experience a little bit of that through the lesson study." At that initial meeting, after we read the Treahy and Gurganus (2010) article about co-teaching models in the mathematics classroom, several teachers remarked upon the idea of both teachers having equal responsibility for the group. Roxy liked the idea, saying "and that's a shift for me in terms of how I've worked with special ed teachers before, [but] I think it will really benefit the whole classroom." Claire was "thinking about the team teaching part, when you're giving a lesson, and then the team teacher, or the co-teacher is up there with you and doing the think aloud with you, I thought that was really interesting, that they might retell in a different way what you said,

or ask you questions that students might be asking, to really help just make the lesson that much stronger." However, while Claire and Vanessa did make some initial attempts to implement this type of co-teaching relationship, most group members did not, nor did the inquiry group as a whole during its research lessons, an issue which will be discussed in much greater detail below.

Institutional factors impeding co-teaching

Over and over again, teachers cited institutional factors that stood in the way of developing strong co-teaching practices and relationships. As Claire wrote in her post-survey, "I am excited about the possibilities of co-teaching while still being aware of the realities of what we can do." Teachers discussed factors ranging from minor issues such as the height of overhead screens to large systemic issues such as the way students were being identified to receive special education services; however, the most commonly identified factors related to time and staffing, and therefore, indirectly, to money.

All participants cited a lack of collaborative planning time for general education and special education teachers as the key reason that they were not able to implement co-teaching practices in their classrooms. This is in line with the research about co-teaching, which suggests that co-teaching relationships will only be successful (for teachers and for students) if teachers are given adequate time to plan and develop strong relationships (Scruggs, et al., 2007). At the time of the study, most general education teachers met with the resource teacher for 30 minutes once every two weeks, and received only an hour or two of push-in support per week depending on the number of students with IEPs enrolled in their classrooms. Vanessa summed the situation up well:

> What I think I knew going into this is that the resource model at Eastside and the amount of, or lack of planning time that we get with teachers, really only allows for one-teach one-assist. And all the other models, you need regular collaborative time that's based on curriculum planning, and that even in our inquiry group time, planning specific lessons, if you're dropping in, and you're not already part of a classroom's routines and structures, it's really hard to implement the other models, because it's the first time and it's new and it's different. Even in rooms like Zoe's and Heather's, where I'm in there for math and I'm in there twice a week doing push-ins, we're not able in our meeting times, we're not given collaborative planning time. We're given collaborative time where it's just enough time to like kid talk. So our current resource model doesn't allow for co-teaching. And if we want to do co-teaching at Eastside, then we have to look at our resource model and look at how to build in collaborative planning time for resource teachers to be in the classroom more regularly. (May 7)

Teachers felt constrained both by the lack of collaborative planning time, and also by the small proportion of class time that two teachers were scheduled to be in a room together. Many teachers noted that resource teachers might be in classrooms only once or twice a week for math lessons, making it difficult to fully collaborate:

> In our article it talks about developing a common instructional language with a co-teacher, and it's hard to do that when they're not there all the time. So if a co-teacher is like walking around to support students and they're using different words…that could be confusing. (Erika, May 7)

At the 5/6 level, general education teachers also felt that the resource staff was not experienced enough and did not have strong enough content knowledge to fully participate in math instruction, and Jennifer herself noted that she needed support to develop her knowledge of math strategies. All three 5/6 teachers also felt that class size at the middle school level, 28 students, made differentiation difficult even with the support of a resource teacher.

Teachers at all levels felt that to adequately support all students, classrooms needed a second adult, preferably a highly experienced resource teacher, for a much higher

proportion of the day. This is obviously a budget issue (as is class size), which teachers felt they did not have much control over:

> Jason: Is there any will to…get an extra person? Is there a will to do that?
>
> Vanessa: I have a will to do it, but I'm not in charge of any budget or hiring.
>
> (Laughter from the group.) (May 7)

Pulling back from instructional innovation

This feeling of powerlessness in the face of institutional constraints may have been one contributing factor to what is perhaps the strongest, though unanticipated finding: teachers in the lesson study group repeatedly proposed instructional innovations during planning sessions, then decided not to implement them, defaulting instead to the models most group members felt most comfortable with, one-teach, one-assist or alternative (small group) teaching.

When we initially read and discussed the co-teaching article, many teachers expressed interest and excitement about a graphic that outlined a variety of possible co-teaching models. For example, Roxy felt that the multiple models offered instructional flexibility, so that, "if they're all generally on the same page, then more of a whole group, maybe team teaching might make sense, if it's half and half maybe the parallel or stations, if there's really a wide range of skills."

During the first planning meeting, the group briefly discussed instructing the class in two equal sized groups (parallel teaching), but rejected that idea in part because only about 25% of the students were likely to need extra support with the content, but also, it

seems, because the group was uncertain that we would be able to implement such a structure regularly:

> Jason: I was thinking about the fantasy of having two teachers in the room, right, and how we're working towards this imaginary wonder and if the work that we're doing is figuring out how to best utilize a resource teacher in our room, it might actually be better for the group to think about that, that small intervention group, and focus on the small group.
>
> Claire: Because that's more likely what we're gonna be using more often.
>
> Jason: Yeah.

However, Zoe, who frequently pushed the group to consider different co-teaching models, encouraged the group to innovate, saying

> That's also not very different than what we've been doing…I think it would be interesting to push and see something different than what we've been doing…I don't feel like seeing someone pull an intervention group is necessarily any different than what's happening right now, whereas I don't think there's any…team teaching co-teaching like number talks happening between two teachers, and I think maybe for me personally it would just be more useful to see what that looks like. (January 15)

For the first lesson, the group ended up planning a lesson that was a hybrid of what Jason and Zoe were suggesting. The group did script out a team-taught number talk for Roxy and Jennifer (the teachers of the first research lesson), and also planned a small group session for Jennifer to work on with students who were identified from pre-assessment as needing additional help.

When the first research lesson was taught, Jennifer and Roxy attempted to implement the team-taught number talk. They did a joint think-aloud, but when Roxy began to engage students in the conversation (as called for in the script), Jennifer faded back and Roxy facilitated the remainder of the discussion. Jennifer rarely interjected, although a back and forth dialogue had been called for in the plan. Roxy's dominant voice during the number talk might be attributed to Jennifer's inexperience with math

instruction, or to the novelty of the structure, but it may also be related to the tendency for general education teachers to view the classroom as theirs to run (Scruggs, et al., 2007). In our debrief of the lesson, Roxy reflected that she "felt like there were things coming up in the discussion that needed to be addressed," and recognized that she had used up more time than had been planned. However, she did not reflect on Jennifer's absence from that portion of the lesson. (Unfortunately, Jennifer was out that day, so she did not have the opportunity to reflect with us.)

As the rest of the group discussed the students they had observed, it came out that while Jennifer had followed the plan we created for the small group, which included prompting for precision and the use of visual models, many (if not all) of the students in that group still had significant difficulty with the focus concept, using benchmark fractions to estimate. As Jason observed, "it's amazing what can happen even in a group of 6, what weird reasoning can go unchecked." Teachers theorized that this difficulty might be related to big gaps in content knowledge, a need for more explicit instruction, language proficiency, or a habit of "slipping into the crack," as Vanessa put it, and the group agreed that we needed to "clos[e] those cracks for her as much as possible." Teachers also noticed that there were students who were not in the small group who needed significant support, and that only the stronger students were participating in the discussion. Vanessa proposed that next time we try a three group model, where one group is sent off quickly to begin working on their own, and the remaining students are split between the two teachers to have smaller group number talks, thus ensuring that all students are actively participating.

However, when the group came together to plan the second research lesson, which would be taught by Zoe and Vanessa, this idea was considered and abandoned.

> Vanessa: So a big question I have about one of the formats that we suggested last time, is we talked about doing three groups essentially, where we like model this, and then we've got our group that we're like go do it, and then we check in, and then we've got one teacher with a group that might need a little bit of support and then we've got the other teacher with the group that needs full support, does that still make sense for this class and this goal and this work to use that same model?
>
> Zoe: So there's gonna be one group who, so you are gonna be working
>
> Vanessa: I would take a group, you would take a group, and then there would be an independent group.
>
> Zoe: I think I don't know if we would have, my feeling is there's gonna be a good amount of kids who actually feel like they can do it on their own. I think it's gonna be very split. There's gonna be some kids who have like no idea, and there will be kids who can really go for it, and I don't forsee that there will be very much middle ground for a third group.
>
> Vanessa: Yeah. (February 26)

Based on Zoe's assessment of the levels of students in her class, the group decided to implement the same whole group team-taught mini-lesson, small group support structure that we had used in the first lesson. Later on in the planning session, I pushed the group:

> Heather: So does this address our concern from last time that kids in the small group were not doing their own thinking? Cause our concern from last time was that even in the small group, kids were…waiting for Jennifer to help them, or doing what the person next to them was doing. So is having Vanessa there enough support that the kids are going to be able, by the end of the lesson, able to do at least one of these independently? (February 26)

Vanessa then proposed that she just circulate and help students who appeared to need help, maybe pulling a group if there was a need. (This model, one-teach one-assist, was also a familiar model to the group and the model that most closely matched the way resource services were currently being provided.) However, the group eventually decided that a small group, pre-determined based on an assessment Zoe had give recently, was the best

structure. The plan was for Vanessa to do a few problems together with the group, and then support them individually.

On the day of the second research lesson, Vanessa was the last teacher to arrive in Zoe's classroom. Because all of the other teachers were there, and the students were beginning to get restless, Zoe began the lesson a few minutes early. This meant that Vanessa was not able to act as a team teacher during the mini-lesson. Significantly, the teachers who had planned that portion of the lesson had actually decided not to script out the interactions between Zoe and Vanessa during the mini-lesson, instead including on the plan, "Zoe is teaching and Vanessa is circulating/supporting students and asking clarifying questions of Zoe if appropriate." Vanessa did circulate to support students, but appeared to interact almost exclusively with the two students in the class who had IEPs. This indicates that despite pushing in the previous meeting for the group to experiment with team teaching, Zoe still viewed her role as the main facilitator of discourse, and Vanessa still viewed her role as assisting students with IEPs.

It should be noted that one of those students with an IEP experienced success with the lesson content, in large part due to the assistance Vanessa gave him with processing information during the mini-lesson. As Claire observed, "She asked [him] to repeat what Zoe was saying, just to make sure, asking lots of clarifying questions and making sure he was really understanding the directions." Therefore, what is significant about the way the mini-lesson was taught is not that there is anything inherently wrong with a one-teach, one-assist structure, but rather that the lesson study group had intended to do something new and ultimately did not.

When the group reflected on this second lesson, it again came out that one student in particular really struggled throughout the lesson, despite check-ins with Vanessa and small group support. This led Vanessa to reflect on where her responsibility lies in terms of prioritizing the needs students with IEPs, as mentioned earlier. She reflected that the research lesson plan "felt inauthentic, and too prescribed to me, and it was challenging to work within the plan and to feel like I couldn't deviate too much from what we planned." Under different circumstances, she felt that what she

> probably would have noticed that there were kids maybe who needed some support, right, but I would have noticed that [student] was completely lost, and in this circumstance I would have spent my whole time supporting [her]. In a way that was more private and quiet and conducive to her staying with me, but I wouldn't have been able to meet everyone's needs that was struggling. There's this middle group that needs support but in this situation it wouldn't have been able to come from me. (March 12)

This led her to reflect,

> My big take away is any time I'm doing push in to support students in any scenario, I don't want it planned out. I want to be able to assess in the moment, and maybe have some really thoughtful ideas about how it could look, right, or like, students that might need help, but without being like definitely pull these kids. I just feel like, um, it doesn't leave enough flexibility in terms of meeting all the students' needs. (March 12)

The group agreed that more on-the-spot assessment and flexible grouping would have worked better in this lesson, for the reasons Vanessa noted but also because, similar to the previous lesson, there were students who had not been pre-selected to be in the small group who had difficulty and needed support. This led several teachers to propose alternative structures for pre-assessment and in the moment support. Erika, Claire and Jennifer all proposed scanning the room to create groups in real time, with Jennifer adding, "maybe…one person's job next time is to be circulating and looking for the students, if we can pinpoint certain things we're looking for and have it be that person's job to point out…I

think [these] two will need extra help, maybe that person could have a specific role for that." Roxy resurfaced the idea of having three groups, and Paula suggested that the group might try a mid-workshop teaching point as a way to bring out a key concept in the middle of a lesson.

Aside from Jason, who suggested that we abandon co-teaching altogether and focus instead on general instructional modifications that could be implemented by one teacher, the group agreed that we needed to try something different in the next lesson. As Zoe reflected, "I would like to see a different co-teaching model…I wish Vanessa could have interacted with the other kids more and I think if we're really gonna do this in our own classrooms in the future, I don't want it to look like just Vanessa's holding resource time in the back corner over there, that to me doesn't feel like co-teaching."

Nevertheless, when the third research lesson was taught, by Jason and Vanessa, this small group structure was used again. This time, when the group planned the mini-lesson, there was not even any discussion of Jason and Vanessa team-teaching. Rather, it was assumed that Jason would teach the lesson. At this point in the lesson study process, the "turf issues" and preference for whole class instruction typical of general education teachers described by Scruggs, et al. (2007) seem to have taken root in the group. This may have occurred because general educators outnumbered special educators, but it may also be that no one in the group had enough of a frame of reference to envision what other models of co-teaching might look like.

In the final planning meeting, the idea of explicitly planning a short warm-up for assessment purposes was also brought up again, but the group rejected it for two reasons. First, some teachers felt that it would slow down the lesson due to the age of the students,

who were younger than the students in previous lessons. Secondly, Jason and Vanessa felt that it would be logistically difficult to share that information in the moment. Instead, the group agreed with Jason's suggestion:

> Jason: I think the best tool um for maximizing her work would be to already know, Vanessa here's your group based on the assessment I did yesterday. You're gonna pull them.
>
> Erika: I agree. I think there might be one or two kids you might change in the moment, but, based on a warm-up, but in general it would happen the day before. (March 26)

Erika and Roxy also raised the idea of a mid-workshop teaching point again, but that idea was rejected for similar reasons.

On the second planning day, as the group was discussing how to construct an error-analysis mini-lesson that would meet all students where they are, a new structure was proposed by Erika:

> Erika: Or maybe two mini-lessons are happening at the same time and not all kids are, like you guys are giving separate mini-lessons, I think that's how I would do this.
>
> Jason: Huh. Huh.
>
> Heather: so more like the parallel teaching model
>
> (laughter)
>
> Heather: Where Jason and Vanessa both are like hey, we collected all these fantastic mistakes
>
> Vanessa: mm hmm, mm hmm
>
> Heather: Um,
>
> Roxy: We're gonna split into groups to look at them.

This idea gained traction, and the group spent several minutes discussing it, including who should be in which groups so that students didn't feel like there was a low group and a high group, and what the content of the two mini-lessons might be. In the end, though, the group decided not to attempt the new structure.

> Zoe: I think just in terms of logistics, just like the size of this classroom, it might be a little bit disruptive to have two lessons.
>
> Claire: Two lessons going on at the same time.
>
> Jason: Yeah.
>
> Claire: I like the idea.
>
> Jason: One group is going to be wondering, what's the other group doing? Who's raising their hand in that group? Yeah, that might be a little bit hard.
>
> Vanessa: And I think it's like something that, say from the beginning of the year, you have a model like this, you build up children's tolerance for that, you build up their resiliency for that type of thing, right? But for a one off, it's probably going to throw our data. It could have been a brilliant model, but we don't know because it was disruptive, because they were like who's that lady?
>
> Claire: And why is?
>
> Vanessa: Why is she working in the corner, nobody ever works over there.
>
> (laughter) (April 16)

Similarly to when this parallel structure was proposed for the first research lesson, it seems that the group was hesitant to try it because it did not reflect our current practice. As evidenced by the discussion cited above, teachers may have believed that co-teaching models other than one-teach and one-assist or alternative teaching were not possible in our current context, and thus were not compelled to try them. As Opfer and Pedder (2011) write, "if the dissonance among beliefs, practices, knowledge, and experience is too large, teachers may dismiss new ideas as inappropriate to their situations." (p. 391).

At the final lesson debrief, the group noted similar students concerns to the previous two lessons—two of the four students in the group with Vanessa did not make much progress, and many students not in the group struggled. As before, the group was very reflective about the planning process, with several teachers naming that the small group structure did not seem to be working. A few suggestions were given for why that might be, including the wide range of needs present even in a small group, and the idea that students begin to anticipate getting support from a teacher and therefore don't develop the tools to help themselves.

> Zoe: I'm thinking about how we can support students besides pulling them in small groups, because I think from all the lessons Vanessa had said, there's just not enough time, I think for your group they got through one [item], and I mean I think there's definite value in pulling kids in small group and working with them one on one, but, I think about like the in-between struggling kids, the kids that might not be in a small group, like what are ways that they can help themselves, like what are the tools and resources that they can use to get themselves unstuck, because I think that's where a lot of the kids struggle is that they just don't know what the first step is. (April 23)

Teachers also reflected on how the lesson might have gone differently had there been a mid-workshop teaching point, with Erika suggesting, "There's a key part in the middle of the independent work where a discussion may need to happen…I wonder if that would engage kids who were just not feeling as confident."

Interestingly, in this final lesson debrief and in the following wrap-up meeting, many teachers mentioned the difficulty we had innovating, and wondered whether or not we had truly tried on co-teaching. On April 23, Jennifer reflected,

> I was also thinking about, um models for push in, and whether or not this model was really co-teaching, or was it more push in, and thinking about what co-teaching really looks like, and I know there are different models for that, sort of like co-teaching in its true form, what that looks like.

And in a subsequent meeting, on May 7, Roxy said, "all of our lessons kind of ended up having a similar structure with a small group, and the mini-lesson, I don't think any of them were revolutionary. It would be interesting to use those lesson times to really like, try something totally different and just see what happens."

Roxy's comment echoed comments made by Zoe, Claire, and other members of the group throughout the process. Yet even though many group members wanted to try a new approach to co-teaching, the group did not. As noted above, when teachers feel a disconnect between their current situation and what they are being asked to do, they may not be able to easily implement new strategies (Darling-Hammond, et al., 2009). The use of co-teaching was not reinforced during the typical instructional day, unless teachers (such as Zoe, Heather and Vanessa) went above and beyond to incorporate it. Because of this, co-teaching remained a good idea whose time had not yet come.

In Opfer and Pedder's cyclic model of school change (2011), "changes in belief lead to changes in practice that bring changes in student learning that bring further change in practice that result in additional changes in belief and so on (395)." It seems that at this stage in the development of the group's thinking about co-teaching and the way we provide services to struggling students, the group was not ready to change their practice. However, there is some evidence that teachers were beginning to change their beliefs about how services should be delivered and who should have access to them.

Positive momentum for institutional change

Despite the difficulty implementing new co-teaching models, all group members felt positively about the potential of co-teaching:

> Jason: I've heard a lot of conversation about how, how there's a feeling of having plateaued, that we can't get more kids moving forward without something else, and I think the whole question of inquiry group this quarter has been, co-teaching as a way to push us forward, and I just want to say that just because this co-teaching model didn't feel like it hit it…there are other things to investigate because I still do think that having two adults in the room can really be heavily leveraged.

While everyone had always believed that having more adults in a classroom would be beneficial, group members began to envision more clearly what this might look like.

> Jason: So, say for instance for Claire and I, if we had at least a third adult for two blocks a week for math, we could, you know, we could level all of our kids based on their math needs in a particular unit, and have, groups, and you know, 2 one hour blocks, that would be amazing. (May 7)

Erika envisioned, "hav[ing] at least an hour to talk/plan. We have a strategic plan…that we are referencing. We are looking at student work and problem solving about what interventions/activities would be best." Vanessa thought we would benefit from having "At least one skilled, experienced, master teacher for every 2 grades/4 classrooms who can provide more regular support during key instructional blocks." And Zoe envisioned the way instruction might change, given more regular support from a resource teacher:

> I've never thought of having a resource model that involves co-teaching, and after participating in inquiry group, it makes me really curious to see how it could work out. I'm mostly interested in seeing a co-teaching model where both the gen ed and resource teacher are in equal partnership -- so that the students really feel like they have two teachers, not just one who is always delivering the instruction (the "real" teacher) and another who only supports. (post-survey)

In large part because of the way resource services were currently scheduled, teachers had limited ability to implement these changes immediately. However, teachers felt empowered to make suggestions for institutional change. As Jennifer wrote in response to the survey question about specific actions taken as a result of the inquiry group, "We have begun to engage in more conversations about how to better provide support for next year."

At the K-4 level, this conversation culminated in a proposal to pilot a new service model during the 2014-15 school year, with the ultimate goal of adding a second resource teacher, so that one teacher would be serving grades K-2 and one serving grades 3-4. In the newly proposed model, the resource teacher would push in to classrooms for many more hours than explicitly called for by IEPs, thus being able to co-teach and provide academic and behavioral support not just to those students with IEPs, but to other students as well. For the pilot year, the resource teacher would spend approximately 8 hours per week of class time with just one grade level, as well as having an additional hour of planning time with the teachers at that grade. The proposal, written by Heather and Vanessa during the final weeks of the inquiry group cycle, was supported by the group—as Roxy said, "I can't imagine it not working"—and later approved by school administrators.

A few weeks after the close of the planned intervention, Vanessa announced that she would be leaving Eastside to take a position at another school. In the weeks that followed, Roxy and Zoe expressed interest in transitioning to a resource role, each citing the pilot proposal and the possibility of having a more intensive, co-teaching relationship with teachers and students as a big factor in their interest; in the end, however, neither of them applied for the role.

Jason, who had been the most skeptical about the co-teaching model during the inquiry group process, in part because he did not have any students with IEPs in his class, so did not regularly work with the resource specialist, and in part because initially viewed small group pull-out as a preferred way to provide services, also expressed interest. He noted in his end-of-inquiry-group survey, "I am excited about applying a thoughtful, strategic model that will serve more students." Jason did apply for the resource teacher

job, stating explicitly during his interview that the work done in inquiry group had motivated him to pursue a transition to special education. He was hired for the job, and at the time of this writing is proceeding with plans to implement the co-teaching pilot project with Heather and Zoe as the general education teachers.

Lesson study implementation

Both on post-surveys and during meeting, teachers consistently expressed their appreciation of the inquiry group process. After our first research lesson, Claire reflected, "And just overall it was a really great experience…I was really looking forward to inquiry group today." Group members noted the building of trust in the group, as well as the differentiated nature of lesson study, because, as Erika said, "people get different things out of it to take back to their classrooms."

Though the focus of the action research project was on co-teaching as a way to build coherence for students, teachers also gained general knowledge of math pedagogy and lesson planning:

> I think that when we get everybody's heads and we put them together and create a lesson together, the lesson is…more outstanding than one can do by oneself…I look forward to just those little insights and those little adjustments that we make as a group because all of our heads are together, and, those help me in my lesson planning. (Jason, April 23)

As mentioned earlier, the group had many robust discussions about general math pedagogy during the planning meetings, and from this teachers took away a variety of pedagogical strategies, including creating opportunities for open-ended discussion, providing visual models and other tools to students, and careful structuring of student practice items as a way to scaffold learning.

While the group spent a lot of time looking at pre-assessments, we did not spend as much time looking at work after the lesson, instead relying on teacher observations of student actions during the lesson. Teachers felt that in future lesson study cycles, the group should spend more time examining and talking about student work after the lesson. Vanessa summed up another difficulty, "outside of our inquiry group time, the structures [for co-teaching] weren't really there, like we were kind of trying to do something without being able to do it." Despite this, "having 3-6 plus resource, having everyone in the room," as Jason said, had been, in Vanessa's words, "transformational."

Implications and Conclusion

Vanessa: I want us to be pioneers in terms of like, if our goal at Eastside is that we are making sure that we're transforming the lives of students who are least likely to succeed, it's the kids who need the intervention, like, not just special ed but all of them. And if I think of us replicating, this is the area where we could be pioneers…

Erika: I mean, we're not doing anything different, our 5/6 is two years below grade level. We are not.

Vanessa: And we have potential to be total pioneers in that area. And those are the kids who we have the chance to make the biggest difference for. And we're not doing it. So. (May 7)

A key question raised by this action research project is, why is it that California schools and school districts are not more innovative in their approach to serving special education students and other students who are struggling academically? While the answer may be partly related to finances, the reality may be more complex. At charter schools in particular, where we have autonomy over budget, staffing, and programmatic decisions, we have a responsibility to reframe "the work of special education through a critical lens aimed at reversing decades of benign neglect of learners from traditionally

underrepresented groups…mov[ing] beyond rhetoric to transforming systems." (Shealey, et al., 2012). Systems transformation is a difficult thing.

In this action research project, teachers believed that special education students and other students with learning difficulties could perform better academically if given the right supports. They believed that students should be served, to the greatest extent possible, in the general education classroom. They believed that having two adults in the classroom at the same time, collaboratively doing the work of teaching, could provide that support. So why didn't we, as Roxy said, "try something different and just see what happens?"

In some sense, we did try something different. Special education and general education teachers at Eastside received joint professional development for the first time in many years, an important step in moving towards a more coherent curriculum for special education students and other students with learning difficulties. But it might be that lesson study is not the right forum for driving the type of systemic change necessary to reform the delivery model for special education and RTI services. While this lesson study process was able to start the conversation (Little, 2006), there are structural features that would need to change in order for the school to make real progress in this area. The degree of change that this would require poses creates greater risk for the institution and its leaders, and "for this reason, people often try to avoid the dangers either consciously or subconsciously, by treating an adaptive challenge as if it were a technical one" (Harper, 2012, p. 51). The challenge of co-teaching is not just a technical challenge. It is also a shift in belief and in structure.

For this reason, institutions and school leaders must play a role in more broadly constructing who receives support, who provides that support, and how the support services are delivered. “U.S. teachers have limited influence in critical areas of decision making,” (Darling-Hammond, 2009 p. 6) especially program evaluation and allocation of budget, both of which are key factors in reforming special education and RTI services. Special education and RTI services must be considered by school leadership teams when they examine overall instructional program coherence, adequate staffing must be a budget priority, and both general education and special education teachers’ time must be structured so that they have the time and capacity to implement best practices for supporting all students. “That,” Erika said, “would unleash some serious excellence.” The question, as Jason asked, is whether or not we have the will to do it.

References

http://achievethecore.org/shifts-mathematics, retrieved August 10, 2014.

Blasé, J., & Bjork ,L. (2009). The micropolitics of educational change and reform: Cracking open the black box. In Hargreaves, A., et al (Eds.), *Second International Handbook of Educational Change*, Springer International Handbooks of Education.

Bryk, A., Sebring, P.B., Allensworth, E., Luppescu, S., & Eaton, J.Q. (2010). *Organizing Schools for Improvement: Lessons from Chicago*. Chicago: The University of Chicago Press. 2010.

Butterworth, B., and Reigosa, V. (2007). Information processing deficits in dyscalculia. In Berch, D., & Mazzocco, M., (Eds.). *Why Is Math So Hard for Some Children?* Baltimore: Paul H Brookes.

Darling-Hammond, L., Wei, R.C., Andree, A., Richardson, N., and Orphanos, S. (2009). *Professional Learning in the Learning Profession: A Status Report of Teacher Learning Development in the U.S. and Abroad*. National Staff Development Council.

Dudley-Maring, C. (2004) The social construction of learning disabilities. *Journal of Learning Disabilities* 37(6), 482-489.

Feldman, J. (2011). Racial perspectives on eligibility for special education for students of color who are struggling: Is special education a potential evil or a potential good? *American University Journal of Gender Social Policy and Law* 20(1), 183-200.

Friend, M., Cook, L., Hurley-Chamberlain, D., and Shamberger, C. (2010). Co-teaching: An illustration of the complexity of collaboration in special education. *Journal of Educational and Psychological Consultation*, 20, 9–27.

Geary D.C., Hoard, M.K., Nugent, L., & Byrd-Craven, J. (2007). Strategy use, long-term memory, and working memory capacity. In Berch, D., & Mazzocco, M., (Eds.). *Why Is Math So Hard for Some Children?* Baltimore: Paul H Brookes.

Gersten, R., Beckmann, S., Clarke, B., Foegen, A., Marsh, L., Star, J. R., & Witzel, B. (2009). *Assisting students struggling with mathematics: Response to Intervention (RtI) for elementary and middle schools* (NCEE 2009-4060). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved from http://ies.ed.gov/ncee/wwc/publications/practiceguides/

Hang, Q., and Rabren, K. (2009) An examination of co-teaching: Perspectives and efficacy indicators. *Remedial and Special Education*, 30, 259-268.

Harper, J. (2012). Leading special education in an era of systems redesign: A commentary.

Journal of Special Education Leadership 25(1), 48-52.

Hawley, W. D., & Valli, L. (1999). The essentials of effective professional development: A new consensus. In L. Darling-Hammond & G. Sykes (Eds.),*Teaching as The Learning Profession: Handbook Of Policy And Practice.* San Francisco: John Wiley & Sons, Inc.

Hecht, S., Vagi, K., and Torgeson, J. (2007) Fraction skills and proportional reasoning. In Berch, D., & Mazzocco, M., (Eds.). *Why Is Math So Hard for Some Children?* Baltimore: Paul H Brookes.

Hollins, E. (2008). *Culture in School Learning: Revealing the Deep Meaning*, 2nd Edition. New York: Routledge.

Hurd, J. and Licciardo-Musso, L. (2005). Lesson study: Teacher led professional development in literacy instruction. *Language Arts*, 82(5), 388-395.

Jordan, N.C. (2007). Do words count? Connections between mathematics and reading difficulties. In Berch, D., & Mazzocco, M., (Eds.). *Why Is Math So Hard for Some Children?* Baltimore: Paul H Brookes.

Kilanowski-Press, L., Foote, C. J., & Rinaldo, V.J. (2010). Inclusion classrooms and teachers: A survey of current practices. *International Journal of Special Education*, 25(3), 43-56.

Lewis, C., Perry, R., Hurd, J. & O'Connell, M.P. (2006) Lesson study comes of age in North America. *Phi Delta Kappan,* Vol. 88(4), 273-281.

Little, J.W. (2006) *Professional Community in the Learning Centered School*. National Education Association.

Magiera, K., Lawrence-Brown, D., Bloomquist, K., Foster, C., Figueroa, A., Glatz, K., et al. (2006). On the road to more collaborative teaching: One school's experience. *Teaching Exceptional Children Plus*, 2(5). Retrieved December 15, 2013 from http://escholarship.bc.edu/education/tecplus/vol2/iss5/art6.

Mazzocco, M. (2007). Defining and differentiating mathematical learning disabilities and difficulties. In Berch, D., & Mazzocco, M., (Eds.). *Why Is Math So Hard for Some Children?* Baltimore: Paul H Brookes.

McCleskey, J., and Waldron, N. (2011). Full inclusion programs for elementary students with learning disabilities: Can they meet student needs in an era of high stakes accountability? Paper Presented at the Council for Exceptional Children Convention, National Harbor, MD.

McNamara, J. and Shaughnessy, M. (2010). *Beyond Pizzas and Pies: 10 Essential Strategies for Supporting Fraction Sense, 3-5*. Math Solutions.

Newmann, F., Smith, B., Allensworth, E., and Bryk, A. (2001) Instructional program coherence: What it is and why it should guide school improvement policy. *Educational Evaluation and Policy Analysis.* 23(4), 297–321

Opfer, V.D., &Pedder, D. (2011). Conceptualizing teacher professional learning. *Review of Educational Research*, 81(3), 376-407

Oxley, D. (2008). Creating instructional program coherence. *Principal's Research Review* 3(5),1-7.

Perry, R., & Lewis, C. (2009). What is successful adaptation of lesson study in the US? *Journal of Educational Change*, 10, 365–391.

Podhorsky, C., & Fisher, D. (2007). Lesson study: An opportunity for teacher led professional development. In T. Townsend & R. Bates (Eds.) *Handbook of Teacher Education*, 445–456.
Netherlands: Springer.

Rea, P., McLaughlin, V. L., & Walther-Thomas, C. S. (2002). Outcomes for students with learning disabilities in inclusive and pull-out programs. *Exceptional Children*, 68 , 203–222.

Richardson, V. (2003) The Dilemmas of professional Development. *Phi Delta Kappan*, 84(5), 401-406.

Royer, J., and Walles, R. Gender, ethnicity, and motivation. ." In Berch, D., & Mazzocco, M., (Eds.). *Why Is Math So Hard for Some Children?* Baltimore: Paul H Brookes.

Schein, E. (2004). Chapter 1: The concept of organizational culture: Why bother? *Organizational Culture and Leadership, 3rd Edition*. San Francisco: Jossey-Bass.

Scruggs, T.E., Mastropieri, M.A., and McDuffie, K. (2007). Co-teaching in inclusive classrooms: A metasynthesis of qualitative research. *Exceptional Children*, 73(4), 392-416.

Shealey, M.W., Sparks. C.W., & Thomas, N. (2012). Defining leadership in charter schools: Examining the intersection of social justice and special education. *Journal of Special Education Leadership* 25(1), 15-24.

Smith, M. K. (2003) Communities of practice. *The Encyclopedia of Informal Education*. www.infed.org/biblio/communities_of_practice.htm.

Treahy, D. L., & Gurganus, S.P. (2010). Models for special needs students: Teachers describe five proven, effective co-teaching strategies for collaborative partnerships with special education instructors and other professionals. *Teaching Children Mathematics*, April 2010, 484-490.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and Identity.* New York: Cambridge University Press.

Appendix A: Sample Meeting Agendas

Planning Meeting

3-6 Math Inquiry Group
January 29, 2013
2:15 - 4:00 pm

2:15 - 2:20: Review the reading

2:20 - 2:25 Check in: One take-away from the reading

2:25 - 2:35 Review and clarify goals of lesson study process and of this research lesson

- Focus of K-6 Inquiry groups this year: CCSS Math Content standards
- Focus of 3-6 Math inquiry group this year: Number and Operations: Fractions
- Guiding question for lesson study process: **What instructional strategies will support ALL students to gain conceptual understanding in math?**
- Goal of lesson: Students will be able to use benchmarks to make a reasonable estimate when adding and subtracting fractions (also, MP2: Reason abstractly and quantitatively)
- Review decisions we've made about the lesson so far

2:35 - 3:15 Design first research lesson, part 1: divide and conquer

- Group 1: Mini-lesson (Roxy, Jennifer, Claire, Zoe)
- Group 2: Student work time and small group support (Erika,Vanessa, Jason, Heather)
- **Script** key pieces of lesson, including anticipated student confusions and teacher responses

3:15 - 3:45 Design first research lesson, part 2: unite and conquer

- Review both parts of lesson together, make necessary adjustments

3:45 - 3:55 Scheduling, etc.

3:55 - 4:00 Reflections

Research Lesson Debrief Meeting

3-6 Math Inquiry Group
February 12
Roxy's room
2:15- 4:00

2:15 - 2:25 Check-in

2:25 - 3:45 Debrief of first research lesson (Yippee!!)

- **What instructional strategies will support ALL students to gain conceptual understanding in math?**
- Goal of lesson: Students will be able to use benchmarks to make a reasonable estimate when adding and subtracting fractions (also, MP2: Reason abstractly and quantitatively)

- Highlight notes and prepare to share (5 minutes)

- Round one: Something funny/cool/notable but not necessarily relevant

- Round two: low inference data (share what you observed, without judgment)

- Round three: Interpretations (_____seemed to be doing _____ because _____)

- Round four: Implications (What is this making you think about in terms of revising the lesson? What is this making you think about in terms of supporting all students to gain conceptual understanding? What is this making you think about generally?)

- Spirited discussion (as time permits)

3:45 - 3:50 Next steps

3:50 - 4:00 Appreciations

Appendix B: Pre- and Post-Survey Questions

Question 1: What works well about the way we currently provide special education services in math?

Question 2: What's not working?

Question 3: How are students with IEPs and other students with learning difficulty doing in math right now?

Question4: What is the general education teacher's role in ensuring that students with IEPs are successful in math?

Question 5: What is the resource teacher's role in ensuring that students with IEPs are successful in math?

Question 6: What do you typically do during the time allotted for Resource/Core collaboration?

Question 7: What do you feel would be the ideal use of the Resource/Core collaboration time?

Question 8: What instructional strategies do you think work for supporting students with IEPs and other students with learning difficulty to learn math?

Question 9: What would it take for all students in our classrooms to be successful in math?

Question 10: What is your knowledge, experience, or feeling about co-teaching?

Question 11: (post-survey only) How has your thinking about special education, student support, or co-teaching shifted as a result of this semester's inquiry group cycle?

Question 12: (post-survey only) What specific actions have you taken in your classroom as a result of this semester's inquiry group cycle?

Question 13: (post-survey only) What specific actions have you taken in your collaboration with colleagues as a result of this semester's inquiry group cycle?

Question 14: (post-survey only) What actions would like to see LCCS take to improve services for special education students and other students with learning difficulty?

Question 15: (post-survey only) Anything else?

Appendix C: Example of Discussion About Math Pedagogy

(On January 15, the group was discussing how to construct a mini-lesson about using benchmark fractions to estimate an approximate answer when adding fractions.)

Roxy: This might be a nice one where they get like the non-example, like someone who did way too much, or something that didn't make sense, so getting a few varieties.

Jason: Right, yeah, um, if you just had three of these on chart paper, you know, let's talk about each one, read them all, I want you to think about each one.

Erika: Kind of like critiquing the reasoning of others, kind of working on the mathematical, I mean that's really what you'd be doing.

Jason: Right.

Vanessa: Is there a need to like reframe, like why do we estimate sometimes, like I don't know what the classes are like. To give a really simplistic model, before we even go into fractions, about like why is it sometimes important to not actually do all the math, and to just like step back and reason.

Roxy: mm hmm

Vanessa: With estimation.

Jason: So maybe, one answer could be, if I'm thinking about 3 possibilities to analyze, one could be, a totally off the wall answer where they added across, right, one could be where they, I think one kid tried to find a common denominator for 9 and 13, which is, way too much work, and it would also get to these kids, who tried the same strategy with a more complex problem, and then you could have a sample of the student who very elegantly just said, well, 8/9 is close to 1, and 12/13 is close to one, about one plus about 1 is about 2. Right, and have them, have them think through those three options, with, maybe the framing question is, what is the framing question? Uh, who used the best strategy to solve this problem?

Erika: Which strategy convinces you? Is most convincing.

Vanessa: But some kids with that might be, I want to see all the work! Like, I'm convinced because I saw the common denominator, right?

Erika: Right, but I also think that's important, so that's one question. I think another question is which strategy is most efficient, so yes, one strategy might be more convincing for you, and I think it's important to unpack for students why is that? I mean, that's just, you know, OK. And then, why is this one more efficient? You know, I mean I think we could, I think those are two important questions.