Increasing Mathematics and English Language Proficiency Through Groupwork

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An Action Research Project Submitted to the Faculty of

The Evergreen State College

In Partial Fulfillment of the Requirements

for the degree

Master in Teaching

2015

This Action Research Project for the Master in Teaching Degree

by

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has been approved for

The Evergreen State College

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ABSTRACT

Research has shown that groupwork can be effective at leveraging student success and language proficiency. This action research study examined the affects of group worthy partner tasks on 3rd grade students in an English classroom in a dual-language program. The study was conducted during the author's student teaching experience in order to examine the ways in which her teaching may be improved through the implementation of group worthy tasks. Analysis of field journals, student work, test scores and student surveys found that partner tasks increase student-to-student conversations. The study also found that partner tasks increase mathematical content understanding. Another, unintended, finding was that student-to-student talk increases overall achievement. Implications for future practice include the need for greater time spent implementing the framework and time spent focusing on the characteristics of true collaboration.

ACKNOWLEDGEMENTS

To my mother, Jesi, thank you for making me fill out the application and take the math class. I could never have done this without you, offering me a safe place to land and reminding me that I am capable of anything I put my mind to.

To my father, Butch, you are the best man I have ever known. Thank you for the countless hours you sat with me and tried to help me understand math. I would not be who I am without your guidance and support. You are wonderful.

To my sister, Jodie, my best friend. Thank you for being the Pooh to my Piglet. Where I am lost, you have always found me.

To my Jenny girl, aloha au i'a 'oe ko'u pu'uwai. You are my sticking post and you always believed in me and understood what I needed, even when I didn't know myself. Thank you from the very bottom of my heart.

To my grandmother, Deanna Claire, those tires have lasted me through the entire program. Thank you for being constantly supportive of my dreams and for challenging me to think critically about what I learn.

To my mentor teacher, Mrs. Appleseed. Thank you for giving me a chance to learn from you, your experience is invaluable.

Finally, to my cohort and my faculty, there is no hurdle I cannot overcome because of you.

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CHAPTER 1: REVIEW OF THE LITERATURE

Problem Statement

Mathematics instruction in this country could be described as subpar. We, as a nation, often fall below our other industrialized counter parts in math achievement and success, especially in poverty-impacted schools. Even with the focus on STEM in middle and high school there is a significant gap in knowledge that derives from a lack of quality instruction in elementary school (Bucholz, 2013). I was a student that was incredibly let down by the U.S. public school system. I was raised in the No Child Left Behind era of high stakes WASL testing and math instruction centered around how to answer the questions on that test. I wondered for years how it was that I got all the way to the 6th grade before someone realized I couldn't multiply or divide, work with fractions or add and subtract fluently. Fortunately, my 6th grade teacher saved me from becoming mathematically illiterate but I wish that I had just been taught mathematics well in the first place.

It is for that reason that I decided to examine how mathematics is learned and understood by children in the 3rd grade. I noticed in my classroom, and other classrooms in my third grade team, that students were struggling with not only learning the content but also applying that content in real world situations. I wondered if the understanding of critical mathematical concepts needed to be connected to solid applications to the real world, answering the question "How am I going to use this outside of school?" In my student teaching placement there was a school wide commitment to improving mathematics scores. This commitment arose from the school improvement plan set in place the previous year. There was an understanding that mathematics is important and

recognition that it had not been a focus in previous years. The school's commitment to students' mathematical understanding seemed like the perfect context to examine elementary students' experiences in mathematics and the ways teachers can support the learning of rigorous but meaningful mathematics.

Context

I conducted my research in a small bilingual Elementary school in a rural Northwest community. The school serves children in pre-school through 5th grade. Orion Elementary[1] is a Title 1 school with 90% of its students on free or reduced lunch and approximately 60% of its population dealing with chronic homelessness[2]. The Hispanic/Latino demographic of the school district is roughly 16%, while the population at Orion was near 70% Hispanic/Latino (28% white and 2% other). In comparison, at Windy Creek Elementary School, which serves the same district, there was a 9% Hispanic/Latino population (73% white and 18% other) (Washington State Report Card, 2015). Spanish speaking students who live within the boundary area that serves Windy Creek tend to enroll at Orion due to its bilingual program. The disproportionate number of Spanish speaking students who attend Orion compared to Windy Creek points to a much larger issue at play in the district as a whole.

There are 4 teachers at each grade level at Orion. Teachers meet twice a week, once during a whole grade-level team meeting and once in a team meeting. During these meetings they catch up on important information and make plans to target students who are falling behind in the curriculum. Test scores for the elementary school show that the

[1] Names have been changed
[2] According to the 2012 homeless census

students test below the state and district averages. In the 2012-2013 school year, 3rd graders were tested in reading and math; 39% were at or above benchmark in reading and 26% were at or above benchmark in math (Washington State Report Card, 2015). These statistics are nearly 40% below the state average in math and 34% below the state average in reading. Teachers and Administrators make a concerted effort to raise standardized test scores so that the scores are an accurate representation of the commitment and effectiveness of the teachers. The administration of Orion Elementary is focused on the district's teaching and learning goal, which is to increase the math benchmark scores to the state average or above. To put this goal in perspective, in 2013 26% of the 78 students who took the state standardized mathematics test passed. The state average was 63% for the 2012-2013 school year. In order to achieve this goal, one of the tasks was to focus on how to use the Common Core State Standards (CCSS) in math to the advantage of the school's unique bilingual program while still offering students a quality learning experience in the classroom.

The classroom in which I implemented my action research project was a 3rd grade English classroom in a dual-language, Spanish-English, immersion elementary school. My classroom had 50 students, split between two classes. In the morning class there were 12 boys and 13 girls. In the afternoon there were 10 girls and 15 boys. 40 of the third graders were students of color and 28 of them were English as an Additional Language learners (EAL). My cooperating teacher said that the school tends to give her quite a few EALs because she is a fluent Spanish speaker. There were 20 children who met the benchmark standards in math at the beginning of the year.

The context of this group of students in this classroom and school presents a unique challenge when it comes to effective mathematics instruction. While there is high academic language demand in any mathematics classrooms, the level of academic language demand in a classroom with a high population of EAL students presents an added element of complexity. Math instruction for these students is not only the transfer of content specific academic language from teacher to student but includes making complex mathematical vocabulary accessible to language learners. The goal of mathematics instruction in my classroom was to provide the most access possible, especially to the large group of language learners. I perceive merit in the dual-language immersion model, yet the question of equity remains. Is it equitable to limit mathematical interactions in the classroom to English only as is the case in this particular classroom?

My students are limited to English in the English classroom during academic activities. What I noticed though is that they communicate in Spanish for partner work and when giving directions to each other. The students do not present their final products to the class in Spanish and I think this is the missing link to successful math instruction. Mathematics benchmark scores have been under deep scrutiny by the district because math is where these students struggled the most. The EAL students in my room tended to think first in Spanish and then translate their thinking into English. This means that for every math problem they solve there are three processes occurring: the recognition of numbers, translation of number symbols into Spanish, and the translation of numbers from Spanish to English. This means that the problem (74+23=) really involves 16 different steps before they are capable of announcing to the class what they are reading and this does not include the actual working of the problem.

There is a prevailing myth that numbers are universal. This is the argument used against EAL math classes and is the reason math is taught in English at my school. Through watching my students I have come to believe that math taught in English is only readily accessible to native English speakers. Students in my class who were non-native English speakers struggled to comprehend basic mathematical concepts when they were presented to students in a language that they did not yet have mastery over. In contrast, when I observed math lessons in classrooms where the content was reviewed in both Spanish and English, it became clear that the non-native-English speaking students in the bilingual approach to mathematics review were faring much better than they were in the English-only approach. This indicated the students found it challenging to internally transfer the math concepts taught in English into Spanish.

Based on the experiences working with my EAL students in the English-only mathematics classroom, I began to wonder what factors contributed to the success of my students. I formed the idea that group work, specifically pairs based group work, could be the key to unlocking their mathematical ideas and understandings. My research was guided by a single essential question: How does group work, centered on developing a community of inquiry, affect mathematics achievement and language development in a 3rd grade dual-language classroom?

My goal was to use group worthy tasks and well-established group norms in an attempt to create a mathematics community of inquiry that encouraged students to communicate in the language they feel most comfortable. Mathematics classrooms in bilingual programs have the potential to present a space to examine how student

discourse centered on complex math tasks not only increases mathematic success but also language proficiency in a student's first language and additional language.

Review of the Literature

As I examined the research literature related to the teaching and learning of EAL students in mathematics classrooms and how group work structures contributes to developing academic language, I found three significant areas of research that influenced this project. These areas included academic language, classroom norms, and status.

Developing Academic Language

Students who are not yet fluent in Standard English can be denied access to mathematical discourse in mainstream classrooms. As mathematics educators begin to work with students who are learning English, known from here onward as English as an Additional Language (EAL) learners, there is a need to not only provide access to mathematical discourse through academic language but also through the non-traditional student discourse of a math class. In order to develop student skills in both mathematical discourse and academic language, teachers must attend to language acquisition as well as meta-cognitive strategy development (Clarkson, 1992, Landry, 1974 & Goos & Galbraith, 1996). Meta-cognitive strategies are ways in which students use their minds to work through problems that challenge them (Goos & Galbraith, 1996). One way to accomplish this is through heterogeneous group work (Barwell, 2003). Grouping students heterogeneously in regard to language proficiency, paired with other teaching strategies such as norms and rich tasks, has the potential to develop both bilingualism and metacognitive problem solving strategies in students (Barwell 2003, Clarkson 2007, Goos

2004, & Hufferd, 2004). Small groups can provide students opportunities to seek clarification and push each other deeper into mathematical thinking. When students engage in the process of asking each other questions, they are using metacognitive strategies for engaging in complex mathematics (Goos &Galbraith, 1996). It would follow, then, that metacognitive strategies for mathematics translate to enhanced language proficiency due to the nature of group tasks. Students must think of their strategies and then be able to succinctly communicate that to their partner on the task.

Access to mathematical language can be denied to students based on their inability to follow discourse and engage in discussions with their monolingual peers. It is for this reason that traditional programs as well as bilingual programs encourage students to enter into the mathematical discourse in their language of choice. In two separate studies of bilingual students in Australia and Papua New Guinea, Phillip Clarkson (1992) found that use of the first language gave students greater access to mathematical discourse in classrooms. This was due to "language switching" or toggling between their L_1 (first language) and L_a(additional language) (Clarkson, 1992; Clarkson, 2007). Switching between two or more languages allows students to put math into contexts that are relevant and provide more access to math talk in the classroom.

Students who are fluently multilingual have a significant advantage over their monolingual and less-fluent counterparts. Multilingual students have been shown to score significantly higher than their non-multilingual cohort on standardized math tests administered by researchers (Clarkson, 1992 &2007; Barwell, 2003). According to Clarkson (1992) these scores reflect a higher cognitive output in students who are fluently bi- or multi-lingual. Monolingual and struggling bilingual students do not have

the same access to content as students who can use two languages to make meaning of the world. Being aware of how the discourse in classrooms affects the ability of bilingual students to enter into content-rich conversations is an important task for teachers.

The implementation of math talk communities has been shown to be an effective way to increase the discourse of the math classroom (Hufferd-Ackles, Fuson & Sherrin, 2004). In a study conducted by Hufferd-Ackles, Fuson & Sherrin (2004), the researchers sought to understand how math talk communities form and interact by examining the nature of the mathematical discourse of one specific classroom across a single year. They described four aspects of math talk communities: questioning, explaining math thinking, source of mathematical ideas and responsibility for learning. Within each aspect there was movement from level 0 (teacher centered) to level 3 (student centered). They found that movement from level 0 to level 3 in relation to questioning happened over time and had to do with the character and origin of questions. In level 0 communities the teacher is the central question asker and in level 3 communities students ask complex questions that extend the thinking of their fellows. In relation to explaining mathematical thinking, movement from level 0, which is characterized by one or two word answers to level 3, which is characterized by defending answers and asking questions of each other's thinking, also happened across time. The findings were congruent over the other 2 aspects of math talk communities. The authors argued that all language is necessary and accepted in multilingual communities. By triangulating their data they were able to show that while this classroom moved between the levels of math talk, the students' ability to rise to the level 3 community was what enhanced learning so greatly in this classroom. In

short, norms are significant because they give students boundaries and directives for their interactions in the classroom.

The authors attempted to strengthen the transferability of their study by providing incredibly rich thick description of the teacher's practice and how she worked to move students from a level 0 math talk community to a level 3 math talk community. The authors provided a description of the context of the study and how the teacher set up the classroom. Because the researchers collected data from multiple sources and triangulated the data, the credibility of the study was strong. The credibility was additionally strengthened by the presence of peer review and a member's check with the teacher that participated in the study.

Group Work

Group work has long been lauded as a way to engage students in the process of their education. When teachers claim that group work doesn't work it may be due to the teacher's use of group work as a teacher-led banking model (Freire, 2000). Instead of empowering students, teacher dominated group work can reinforce existing social norms and status dynamics between students (Cuban, 2010). In many cases teachers do not have the background in strategies for equitable group work that is needed in order to successfully use group tasks in the classroom. Complex instruction (CI) is defined by Elizabeth Cohen and her colleagues (1999) as "an instructional approach that allows educators to address these questions successfully. In CI, teachers use cooperative group work to teach at a high academic level in diverse classrooms. They assign open-ended, interdependent group tasks and organize the class-room to maximize student interaction" (p.80). CI offers teachers a structure to support students as they engage in complex group

tasks through differentiation and without tracking or ability grouping. The tasks of students in CI classrooms are quite broad and open. Students in CI classrooms engage in complex group-worthy tasks in small groups as often as the teacher feels they are necessary and useful. Teachers create tasks that are not easily solved and require more than one person to successfully complete the task. Working with tasks such as these creates an atmosphere where students need to be able to work collaboratively and use each other as resources. There is an added layer of complexity when each group in the classroom has mixed ability and language proficiency.

Teaching students to work collaboratively and equitably is a cornerstone of CI. Without proper education on how to work collaborative and equitably, students often experience an interaction like the following:

Group B is given a group project by their teacher. Eileen, a straight-A student, is afraid that Terry and Janice won't do a good job and may not know the answers to the many questions on the worksheet. Eileen takes the paper and begins writing notes and doing the assignment. Josefina, a new student, tries to get Eileen to let her help but because she does not yet speak English fluently, she cannot find the words to make Eileen share. By the end of the class, Eileen has finished the assignment and put the names of her group members on the top. She feels that she could have gotten just as much out of the task had it been an individual assignment, and then she would not have had to do all the work for everyone else. Josefina is concerned that she will continue to be left behind in the classroom. Terry and Janice, while happy they did not have to do the task, will still receive credit and have not gained any additional mathematical concepts for skills.

Consider instead a classroom where every student, regardless of language proficiency or ability, has access to the mathematics. Access is important to successful implementation of group instruction in the classroom (Arellano et al., 1999). Access is an important part of collaboration. Barron (2000) conducted a study where she analyzed the interactions of two small groups. She was looking to see what types of interactions produce or inhibit collaboration. Both groups did the same problem and were given the same instructions. Barron found that in one group, students were more likely to interact collaboratively. Collaboration in this group took place in the form of sharing the task sheet equally between all partners. Phrases and answers that validated group members, and students offering new material and equitable space for the whole group to speak, were also evidence that collaboration has occurred. Comparatively, the second group was less collaborative. First, one of the members, Brian, began by immediately taking the task card and starting the problem. This caused the rest of the group to disengage from collaboration. Repeated attempts at collaboration did not increase access to the task. Group Two demonstrated that access is essential to the completion of complex tasks. Group Two included a high-status child working with two low-status children. Due to their lower status, the two other group members were denied access to the task (Barron, 2000). Other research on access and status shows that students who are taught how to work collaboratively gain greater negotiation skills, are more likely to encourage collaboration in other contexts, and have greater ability to apply meta-cognitive strategies to non-traditional problems (Oxford, 1997; Jansen, 2006; King, 1993; Cobb et al., 1991).

Research shows that heterogeneous grouping can also increase achievement and metacognitive development by challenging students to work in ways that are different

from the typical method of direct instruction (Cohen & Lotan, 1995; Yackel, Cobb & Wood, 1991; Goos & Galbraith, 1996). A heterogeneous group is one characterized by difference. Groups like these have students of varying abilities, ethnicities, language proficiencies and interests. In most public schools, there is a high occurrence of homogenous grouping due to academic ability tracking. Homogenous groups are those that are characterized by sameness. Homogenous groups are most often categorized by ability or language proficiency. Ability tracked groups (homogenous groups), which are labeled "low" tend to have a higher number of people of color and people with lower socio-economic status while "high" labeled groups tend to most often be composed of Caucasian people with high socio-economic status (Cuban, 2010).

In complex instruction classrooms, groups are arranged heterogeneously to encourage students to work collaboratively with everyone in the classroom, to orient students as resources for each other, and to broaden the students' understanding of smartness and what it means to be competent (Arellano et al., 1999). Not only do these types of groups encourage non-traditional approaches to mathematics, they can also improve language proficiency.

In the classroom in which this study took place there were twelve English language learners who all needed access to the vocabulary and structure of academic mathematical English. All of the math tasks that were implemented had a secondary purpose, which was to improve English proficiency. Complex math tasks were used as a structure that allowed students to increase their proficiency in English and gain skills in mathematics concurrently. This was due to the interaction between proficient and non-

proficient language speaking students who mutually engaged in collaboration (Arauz & Wells, 2006; Arellano et al., 1999; Oxford, 1997).

Peer to peer collaboration is a strategy that can support EAL academic language development in the classroom (Barron, 2000; Cox, Lobel & McLeod, 1991; Dembo & McAuliffe, 1987; Oxford, 1997). When EAL's and native English speakers see each other as resources in the process of learning a symbiosis is created which can lead to increased engagement. Research shows that students who are encouraged to seek their peers as experts are more likely to find the solutions to complex math tasks (Clarkson, 1992; Featherstone et al., 2011). This translates to being more able to take risks and collaborate outside of the mathematics classroom (Arellano et al., 1999; Featherstone et al., 2011; Oxford, 1997). In CI classrooms, collaboration, status, and access combine to create situations where students' cognitive processes are valued and necessary for the learning to take place.

Classroom Norms

Classroom norms are the established rules and etiquette for classroom interactions. Norms, once established, can bring calm and ease to a classroom (Wolk, 1998). In math classrooms norms can become a structure for quality math talk. Norms such as "I can't…yet!" or "Everyone is an expert" can allow students to feel empowered to try new ideas and figure out how to work collaboratively in ways that make sense (Featherstone et al., 2011; Goos, 2004).

Norms are also important in creating a classroom that is culturally responsive. Weinstein, Curran & Tomlinson-Clarke (2003) state that a culturally responsive

classroom relies on the establishment of expectation of behavior (norms) and the intentional development of a classroom environment. Norms and expectations can be inclusive to students from a broad range of cultural and linguistic backgrounds by making respectful interactions a requirement of the classroom community. This research is supported by the work of Yackle & Cobb (1996) on sociomathematical norms in the development of a responsive classroom environment. Sociomathematical norms are "…normative understandings of what counts as mathematically different, mathematically sophisticated, mathematically efficient, and mathematically elegant in a classroom are sociomathematical norms" (Cobb & Yackel, 1996, p. 461). Sociomathematical norms are different from regular norms because they apply not only to the mathematics but also to the status and social interactions in a cooperative math classroom. The teacher in the classroom plays a significant role in the development of sociomathematical norms. Classroom teachers must model and encourage mathematical norms in the classroom in order for students to enact them in their own thinking. Sociomathematical norms create spaces where students can try out new thinking, push their thinking, and use the group as a springboard for new ideas.

Autonomy is a large part of the establishment of norms in the classroom (Deci, 1995). Students need to feel able to solve a problem on their own, whether math or interpersonally related. Established norms can include things that students can hold each other and themselves accountable for within the classroom. When norms in a mathematics classroom are present, students are better able to enter quality discourse with each other centered on the complex tasks that have been laid before them (Goos, 2004; Weinstein, Curran, & Tomlinson-Clarke, 2003; Featherstone et al., 2011).

In the book *Smarter Together!* Heather Featherstone and her colleagues (2011) introduce the idea of role cards as a way to increase student engagement during group work. Role cards encourage teachers to put their norms into established group work practices. The cards describe jobs such as the *facilitator*, *resource monitor* and other titles, to make sure that work is being shared equitably within groups and that all students have access to the math task. For example, if a norm in the classroom is, "Math is for everyone, take turns listening and suggesting," the role of the *Equity Monitor* is to make sure that everyone in the group is being heard when they offer an answer and that everyone understands the process to get the answers. Roles also give students who might not otherwise have access to the math, including students who are EAL, a mode of entry during group tasks. Sociomathematical norms like "everyone can learn math" or "we are not there yet!" create spaces where collaboration and access are possible in classrooms (Cobb & Yackel, 1996). In order to fully develop skills of collaboration in young students, the implementation of structural norms is essential.

Status and Perceptions of Competence

Status in a classroom is the perceived hierarchy in which students believe it is better to be of high status than low status (Cohen and Lotan, 1998; Featherstone et al, 2011). High-status students are those who are perceived by the group as smarter, faster or funnier, whereas low-status students are those who are not perceived to be smart, physically fit, or funny. Within the classroom, status plays out in many different ways. In general students either hold academic or social status. Students who hold academic status are good at school, considered by teachers to be the smartest kids in the class, or get the best grades. Students who hold high social status are friends with everyone or never

struggle to find a partner. Access to a task can be impacted by status. As stated earlier, if students have low status in the classroom they are less likely to be included in group processes. They are also less likely to have their ideas considered by others, and may ultimately get less out of the group task than higher-status students (Cohen and Lotan, 1995; Usher, 2009; Mitman & Lash, 1988).

Academic and social status affects student participation in complex group tasks. Research shows that lower-status students have less access in group work due to their inability to break through social barriers (Barron, 2000; Cohen & Lotan, 1995; Dembo & McAuliffe, 1987; Featherstone et al., 2011; King, 1993; Mitman & Lash, 1988; Usher, 2008). These same studies have shown that it is not because these students are less capable of doing the math. Instead, their ideas are not considered seriously by their peers due to low status interactions (Barron, 2000; Mitman & Lash, 1988; Mulryan, 1995; Usher, 2009). It is important to point out that it is not just students who hold perceptions of competence of other children. Interactions between parents, teachers, and principals can establish or reinforce a child's status in the classroom (Cohen and Lotan, 1998).

Translating this to a group work situation begins with an in-depth look into how the classroom community works as a whole and how a teacher assigns competence. Assigning competence is a way for teachers to begin to limit the effects of status interactions in the classroom (Cohen & Lotan, 1995; Gnadinger, 2007; King, 1993). Teachers cannot overcome status, as it exists everywhere, but assigning competence reduces status differences and therefore creates more room for growth and space to work collaboratively. Assigning competence can be as easy as praising a struggling student for an intellectual contribution. However, the praise must be specific to the task, connected to

the mathematical learning, and make public (Cohen,). For example, a teacher might say to the class, "Susan used this really interesting strategy to solve this problem, thank you Susan for contributing to our discussion." Teachers can also assign competence by relating the ideas of one student to another. For example, "Billy, I heard you say that 5 times 4 equals 20 and you solved it by creating an equal groups picture. Remember earlier when we learned how to do that from Susan? This is a great way to solve these kind of multiplication problems." By assigning competence to Susan, a student who is perceived to be less competent in mathematics, the teacher is elevating her role in a mathematics conversation to that of expert. Essentially, the teacher is communicating to the other students that Susan is mathematically competent. Because the teacher holds a great deal of power in the classroom, assigning competence can greatly impact the status of a student.

I have noticed that the students in my 3rd grade English classroom most often defer to the native or fluent English speakers during group work. I believe this is because they do not perceive themselves as linguistically competent and therefore do not feel they will benefit the group. These same students struggle in mathematics. Group work can be beneficial to the process of developing important metacognitive skills in mathematics that my students need. By implementing group work in my classroom, with the expectation that interactions in English or Spanish are equally acceptable, I hoped to allow my students greater access to mathematical learning. What I found was that working in my classroom with complex instruction in mind helped the Orion elementary students achieve their ultimate goal and increase mathematics understanding in my classroom.

CHAPTER 2: METHODS AND ANALYSIS

Action

For this Action Research project, I worked to implement group tasks using complex instruction. I began this work with the intention of implementing two tasks per week for four weeks using complex instruction for four weeks. What I found, during the first task, was that in order for my new method of teaching to work I needed to spend time teaching students how to work collaboratively. Due to this revelation I implemented a four-week, group work characteristics workshop followed by three partner tasks. I made this change for three reasons. First, I found that it was a very complex undertaking to implement group roles, group norms, and four person groups, all in a ten-week period. In order to effectively study group work and its effect on mathematics achievement in the time that I had, I decided to focus on what I thought were the most important aspects of complex instruction: group work characteristics and small group interactions. The second reason I decided to implement pair work was due to observations I had during a preliminary four-person task. My students had never before been asked to work collaboratively, over a long period of time, with more than one other person. I knew from the first task that I needed to start where my students were and introduce the ideas of collaborative characteristics in a setting they were more used to. The third reason for this change was that I knew my mentor teacher would continue the format I had set up because she was more comfortable having students work in pairs. I felt the need for the work we did together in ten weeks to be consistent throughout the year and working in pairs focused on characteristics was the most effective way to create a consistent structure. I encouraged students to think about how the attributes of sharing, asking

questions, and taking responsibility for their use of resources affected their work in the classroom.

Specifically, I implemented partner tasks in which students needed to work with a partner in order to succeed. I created the tasks to push students' thinking on the content that was being introduced in the multiplication and division unit. For example, my first task was for students to attend a workshop about equal groups pictures or arrays led by my mentor teacher or myself. Students were then sent back to their table spots to complete a task, which required both of the new understandings they had just received. Students had to solve a multistep multiplication problem using an array and an equal groups picture. The problem could only be solved by a partnership and I used it to push my first characteristic, fairness.

In order to implement the tasks I first set up a characteristic t-chart for social skills and worked with students to decide what fairness looked like in our classroom. We then practiced that characteristic for a week, completing one partner task at the end of the week. Second, I conducted a t-chart for a social skills lesson that helped students understand how to ask questions in the classroom. Students came up with things like "ask my partner first, my group members second and Miss. Chapin last." As well as "thumb under my chin lets people know I have an idea without being distracting." After asking questions we practiced for two weeks with the two characteristics I had already introduced and then I led the t-chart for social skills lesson for Using Resources. This t-chart coincided with a task in which students needed to create a model of a division problem using manipulatives. Once students had practiced all of the social skills I then

implemented four more partner tasks, which were not linked directly to the social skills but had to be completed by the partners as a cooperative pair.

I had several low-achieving and low-status math students. When these students provided an answer and strategy during group work, I would make sure to let everyone in the classroom know that their contribution was important. I confirmed their thinking and assigned them competence for an intellectually strong strategy. Through this interaction, I also oriented other students to the strategy as a way of confirming to the class that low-status students had ideas worth considering. These interactions translated into their group work, with low-status students at least being allowed to enter into mathematical conversations. I did this to enhance their interactions in the pair's tasks as well as to enhance status interactions and characterize everyone in my room as smart and capable.

Study Participants

The students in my room varied dramatically in mathematics proficiency. Of the 50 children: 15 have passed the math MSP, 65% have passed the math benchmark tests for 2nd grade, and 3 have IEPs (Individualized learning plans) for math. Most of my students, while they would benefit from pullout math groups, were kept in the classroom to benefit from access to Common Core State Standard-based instruction. My intent was that using partner tasks, which focused on characteristics, would give them more access to mathematics and allow them to learn language with each other.

Out of 50 children in my classroom, split between two classes a day, 29 were English language learners (see table 1 for the breakdown of language proficiency).

Table 1

WELPA Levels for 3rd Grade Study Class

WELPA Level	Number of Students
Level 1	2
Level 2	10
Level 3	12
Level 4	5

Table 1

Designing and Implementing Pair Tasks

Small table groups of four were generated using a system of language proficiency and mathematical proficiency so that at every table there was a heterogeneous mix of abilities and language abilities. Pairings were mostly homogenous based on mathematic proficiency but not on language ability. These groups stayed the same for the duration of my research. This allowed me to draw direct conjectures based on continued collaboration by the same children in similar circumstances. My room had six tables identified by a colored table basket. Yellow table was in the back of the room; purple, blue, green and orange tables were arranged in a straight horizontal line across my room with red table vertically connected to orange table. I used color and table spot numbers to choose students at random to share out during instruction and task debrief. Partners were determined based on who sat immediately to the students' elbow. This was uniform except for orange table, which had five students. In both classes the student who sat in table spot five had some kind of need that made their work with two other people important. In the morning class, the student who sat in table spot five had autism; his

math content was taught by the Special Education team and my classroom provided him interactions with his age-similar peer group. In the afternoon class, the student at orange table spot five was a student who was brand new to the country, who spoke no English, and very little standard Spanish. These two students were encouraged to interact with their group members as they were able and the partners they had were expected to include them in the work being done. Partner groups did a collaborative task once a week for five weeks. Two of the tasks were focused on practicing characteristics of fairness. During week three of the 10-week period, I introduced the characteristics of fairness. The students and I co-created a t-chart and came up with a definition for fairness and what it looks like and sounds like during a collaborative task. On Friday of week 3 we had a final pair task, which I collected as data to practice fairness (see Appendix A for an example of the first collaborative task practicing fairness). Weeks four and five were conducted using a similar process for asking questions and resources. Those three characteristics guided our work as we went into weeks six, seven, and eight. During these weeks, students engaged in complex partner tasks that enhanced their understanding of multiplication, which was our unit of focus for the ten weeks I was in the classroom (see Appendix B for week six task as an example of the three weeks of group tasks).

Data Collection

In order to set up my classroom for data collection, I looked at state administered language proficiency exams from the previous year to figure out how many of my students were language learners and where they were on the level 1 through level 4 scale. In this action research project the levels are described as follows: Level 1 describes a student who is brand new to English. They may have no contact at all with common

phonemes and structure. Level 2 describes someone who has an emerging understanding of English although this could be non-standard English. Level 3 describes a student who is nearly proficient in English, understands the basic structure, and has much of the grade level English vocabulary needed to succeed. Level 4 is when students exit the state language-learning program and is considered to have native fluency in a language. I used this information to create heterogeneous language groupings at each table group. I also looked at exiting mathematics scores from the second grade to more fully understand their mathematical understandings coming into my classroom. This helped determine heterogeneous groups of four, with partners being homogenous mathematically and heterogeneous linguistically. During the second week of school, we administered the district math assessment, which is intended to be a 3rd grade common core overview. This served as a pre-assessment of the unit I taught during data collection. I paired this data with the end-of-unit Multiplication and Division exam to determine how attributes and partner tasks may have increased students' mathematics proficiency.

Surveys

I gave my students a survey at the beginning of the year which provided statements such as "When I learn, I prefer to learn alone" or "I like to work in groups." These questions measured initial preference working with partners or groups. I also provided statements that dealt directly with efficacy in mathematics ("I am good at math") and English language ("I can express myself best using English" or "I can express myself best using Spanish"). The students answered these questions using smiley faces, frown faces or middle line faces. I gave them the same survey at the end of the study period as a comparison to their answers in the first of the year. These surveys were used

to understand how group work had previously affected students in the classroom and how it may impact them in the future. I also saw the surveys as a window into discovering if pair complex group tasks changed the student's ideas about how competent they perceived themselves to be at math.

Test Scores

The students were given standardized tests, called DIBELS and EDEL, which gauged their English and Spanish reading fluency and comprehension each year at the beginning of the year. I used these scores, taken the first week of school and the week after my collection period ended. I chose to collect data on reading fluency because this is most often an indicator of higher language use ability. If students can read in Spanish and English, they are more likely to be able to speak fluently in Spanish and English. This data set allowed me to draw conclusions about whose academic proficiency was raised through the implementation of complex group tasks. My research question dealt directly with language acquisition and academic vocabulary. Through analysis of the reading test scores I was able to gauge who had grown in their ability to use and read English.

I also collected data about the student's mathematical abilities coming into the classroom through EasyCBM. This test measured their understanding of concepts present at the beginning of the year. A test administered after the end of data collection measured their end of unit proficiencies. The EasyCBM test was used to gauge that students had come away from the unit of study with an increased understanding of multiplication and division. I used this data to understand who was positively affected by complex group tasks in the classroom.

Field Notes

As a teacher researcher, I took meticulous notes after each group task. I would sit, around 3:30 each day at the back of my classroom and take notes based on observation and interactions that I saw. I focused on how interactions in groups were affecting the work of the group members as a whole. I recorded moments of collaboration as well as times when the groups did not act collaboratively. Questions I posed to myself at the end of each task were 1) what did you see that addresses the research question? and 2) What is one thing you need to attend to better during the next task? These questions guided my understanding of my bias in the classroom, the work that needed to happen in order for the next task to be successful and, much later in the process, allowed me to come up with some codes for the data sets I was examining.

I also took notes while tasks were completed by the students and recorded student quotes that gave me information about collaboration and status. I used field notes as data on specific student-to-student and teacher-to-student interactions that increased English language proficiency or mathematic understanding.

Student Work

After each complex task I collected student's work, scratch paper and final products. Their work included exit tickets and entrance tasks, work done in small groups in preparation for complex tasks and math journal entries specifically related to math task concepts. Scratch paper was paper that student groups used to work through the group tasks. These pieces of scratch paper were used to make sense of the work done to complete the final product. The final products collected were representations of the most

complex thinking the students did. Many times this final product was shared during a math congress and helped students gain a better understanding of the task itself. I used all of this work code for student collaboration as well as potential growth in their mathematics proficiency. My research question was informed through this process due to its relation to mathematical proficiency. Through examining student work I was able to understand how these tasks affected their proficiency. Student work was used to triangulate observations and field notes to show potential growth.

Data Analysis

In order to analyze my data I focused on the frame work set up by Donna Mertens (2010) by first reading through all of my data and taking notes, gathering observations and asking myself questions (p.425). This process, called memoing, leads to a more in depth process in which memos become codes. Codes are specific thoughts or consistent ideas that show up in the data. At the completion of my data collection period I began memoing my field journal, student work, student surveys and test scores. I analyzed my field notes first and, after a solid read through, I began coding the notes focusing on the ways in which students in my room were demonstrating their use of important mathematical vocabulary. From this set of coding I found myself writing memos that led me to coding for coinciding moments of mathematical vocabulary use and mathematics successes or moments of new learning through the tasks. It was through this memoing and coding process that I discovered my first continuous code, “aha” moments. These were times when students either used a new piece of vocabulary from a lesson or explained something that they had not explained before. As I read my memos from my field notes I noticed that I needed to move from that data set to the abundance of student

work I had. I coded the student work focusing on collaborative and non-collaborative student interactions and quickly noticed consistent memos focusing on "collaboration in action." This turned into a theme that developed across all of my sets of data.

As the codes began to come up more frequently I took time to look through my student surveys and found that there were three specific questions that related directly to my research. I used the answers to those questions to begin looking at specific students and how they experienced the partner tasks and characteristics lessons. I memoed student work and test scores specifically with the survey responses in mind and found my final theme, overall achievement. This process of coding and memoing allowed me to more fully understand my data and helped me draw conclusions, which will be discussed in chapter 3.

Statement of Limitations

This study was conducted in my student teaching classroom. This implementing my mentor teacher's classroom management style and using many of her grouping techniques. The techniques and style, while useful to her, were new to me and thus required some learning in the beginning of the year.

Using the "Criteria for Judging Quality in Qualitative Research" (Mertens, 2010), which includes; credibility, transferability, confirmability, and transformative criteria, I have critically analyzed the limitations of my study.

By not randomly generating groups I threatened the transferability of the study (Mertens, 2010). I decided not to randomly assign groups due to the population I was working with. I had a high occurrence of EAL students as well as students who entered

3rd grade well below grade level proficiency. I created groups through a process of pairing students who were academically similar but had varying language proficiency levels. Despite the work of Cohen (1999), I also decided use student pairs for every task. Cohen's framework has students working in groups of four, which increases the amount of resources each student has. I chose groups of two because they are still considered small groups and I found that students were more able to find one person as a resource while working with four people became overwhelming, especially so early in the year. I talked with my students about the fact that each person in their table group was a resource but that their partner was the only other person they were actively working with. This created a system where everyone had value, everyone was an expert, and everyone had to be accountable for understanding the math. I made this decision due to a reaction that took place during our first four-person group task. I realized that students needed more focused pair work time in order to become fully capable of collaboration. I was also working with students who had highly specific needs – EAL students and students impacted by poverty, many of which had gaps in understanding. I implemented this complex instruction in a way that was targeted toward their success in my specific classroom. In order to strengthen the transferability, I have included copies of the surveys I used, student work and segments of my field journal in the Appendix. I also attempted to provide details about my action, the student participants, and the context of the school in which I taught. This was all in an effort to provide the reader with enough information to make a determination of the transferability of my findings to their own contexts.

The credibility of my study is limited due to the limited amount of time available to implement my action and collect my data. This was mostly the result of a heavy

standardized test load on the third grade students. In the district I was placed, there was a higher amount of testing for the bilingual program due to the WELPA and dual tests administered for English and Spanish subjects. This was compounded by a higher than average test load mandated by the government to assess failing schools. Time in my classroom was also abridged due to the 10-week time frame of my student teaching placement.

To increase the credibility, I collected data from multiple sources. I used methods for coding my data taken from many sources that are founded in empirical research (Auerbach & Silverstein, 2003; Mertens, 2010). [Say something about triangulation since this is the foundation for credibility…go back to Mertens and re-read credibility.] I also engaged in peer reviews completed by four people in my teacher preparation program. These four people worked with me during the data analysis nperiod to help code and understand my data and to read my chapters and provided helpful insights into my process.

This study is transformative because it was conducted in a school with a high population of people of color and a high poverty rate. My research questions looks at achievement for a minority population, non-native speakers of English and my practice seeks to create an inclusive place for all students to learn and achieve.

CHAPTER 3: FINDINGS

My paper is focused on group work and its effects on mathematical learning and language proficiency. In order to understand this question I analyzed field notes, student work, videos and test scores I collected in my student teaching placement over a period of 10 weeks. Through my analysis I found three themes, two intended and one unintended: partner tasks increased student-to-student conversation about math, partner tasks increased mathematical content understanding, and student-to-student talk increased overall achievement. In chapter three I will discuss these findings, the implications of the themes I have found, and questions I would like to pursue in future work.

Partner Tasks Increased Student-to-Student Conversation about Math

Through my analysis of student work, field notes and surveys I realized that not only were the tasks helping students understand math but they also increased the amount of time students were talking about the tasks. This finding relates directly to my research question because I was looking for ways that group tasks affected academic English proficiency in my classroom. During the first task I noticed more often than not that students were choosing one person to do the task and that person was doing all of the mathematical thinking. By encouraging the use of norms and working with students on what fairness looks like when we are speaking, as well as talking and working, I was able to move my students from a level 0 math talk community into a level 2 math talk community. This movement, from teacher-centered understandings to a student-to-student based interaction happened slowly. It began with the T-Chart for social characteristics. I made three charts with students, one for fairness, one for questioning, and one for resources. These charts were integral to the math tasks as we moved further

into the year. I saw students using them as anchors for their interactions with each other. By task 4 many of my students had moved from looking to me as the task manager to looking for each other's input and understanding, with me as a facilitator of their learning.

In transcript 1 (see Appendix C) Kimmy and Cecilia[3] are working through task 4. This task was the first one that was not focused on practicing characteristics of fairness and took place in week 6 of the data collection period. Kimmy was considered low-status in mathematics and was at a level 2 on the WELPA. Cecilia was a high academic-status student who was also at level 2 on the WELPA. Students were asked to solve a multiplication problem using multiple groups' pictures, counting by multiples, repeated addition, arrays, and the number line model. I had not yet provided explicit instructed on the number line model or repeated addition. Students had only learned arrays and equal groups two weeks earlier during task 2 of the data collection period. Kimmy and Cecilia worked through the problem entirely in Spanish, which is seen in translated form in the Appendix. The conversation centered on Kimmy and Cecilia's use of a number line model that showed a multiplication sentence. The two girls remembered the pre-test for the unit and wanted to see if they could work it out on their own. Their student work in Appendix E shows that they did not quite understand how the number line worked but the conversation was incredibly fruitful, mathematically rich, and the problem was worked through by both of them equally.

Julien and Brycen was a pair that I noticed immediately. Julien was at a level 4 on the WELPA with high social status but was a wanderer. Brycen was at a level 2 on the

[3] Names in Chapter 3 have been changed to protect identities

WELPA and was perceived as low academic status. When I first began observing their interactions with each other, I noticed that Julien would write something in pencil and then have Brycen trace over it in his color marker. Julien was doing most, if not all of the thinking during our tasks. I think this was due in part to the lack of complexity that Julien saw in the story problem contexts I was providing, as well as Brycen's limited English. Julien did not see Brycen as a mathematical resource until task 5, one in which they were working on a patterning task where they had to determine what came next. At this point, Julien became stumped; he could not work out the pattern in the numbers. He turned to Brycen and asked, "Do you think you could help me figure this out?" Brycen perked immediately, having been invited into the task. They set about, in Spanish, working through the problem together. I could see Brycen adding things in the margins of his notebook and sliding it over to Julien who would then compare it to what was already in the problem itself. Soon they had figured out the first missing number and worked together to figure out if the pattern repeated or not. This shift contributed a great deal to our subsequent class discussion where we talked about all of the patterns the groups had found. This discussion was the first where Brycen felt that he had something to contribute. Julien and Brycen was initially a pair that would not use each other as resources; however, by task four and through the end of the study period, they became better able to use each other's thinking as a buoy to understanding the problems they were given.

During the final day of the study period I had students do a task where they had to figure out how many pumpkin seeds they would get out of 6 pumpkins with 200 seeds in each pumpkin. They then had to parcel out the seeds into servings of 25 seeds each. I

wanted the partners to determine how many people they could give seeds to at a Halloween party. My students were faced with a task much more intense than they had previously encountered. We had not yet introduced multi-step multiplication and division word problems. Figure 1 shows the story problem that I wrote for the task. It was based on a similar problem my mentor teacher had used the year before.

> Marta and Toby are throwing a Halloween party! They bought six pumpkins so that they could carve jack-o-lanterns and make pumpkin seeds. Marta counts all of the seeds and finds that each pumpkin has 200 seeds inside. She knows that each serving of pumpkin seeds should be about 25 seeds per person at the party. How many seeds are there altogether? How many people is she going to be able to feed pumpkin seeds to if every person gets one serving? Show your answer suing words, numbers and pictures.

Figure 1: Story problem provided to students as a partner task.

As they began working with the problem I noticed a distinct murmur around the room. I call it a productive hum. Every time I stopped I saw students engaged in a collaborative task. They were asking each other questions such as "How did you decide we should draw 6 pumpkins?" and "I am wondering how we can quickly count all of the seeds. Do you have an idea?" and my favorite, "I am stuck on dividing these seeds, does she mean 25 people or 25 seeds in each group?" Not only did group tasks increase student-to-student conversations, it increased their use of academic language in the unit. Across the board both in my research notes and student work I found evidence of productive dialogue happening between students.

In student surveys from the beginning of the year there was not a single student who indicated that they enjoyed working cooperatively. The students did not see their peers as resources in a math classroom. On the three questions that I asked students about collaboration, frown faces indicated that they were uninterested in working in groups, did

not like explaining their thinking, and did not feel that their ideas were important. The first two questions are what I focused on most when I analyzed the surveys I administered in the last week of the study period. I asked students the same three questions and 80% of my students changed their frown marks into smile marks. I used frown marks and smile marks because I wanted students to be able to indicate their feelings on each question. The answers to those questions about collaboration, specifically the question that was phrased "Do you like to explain your thinking?" were incredibly telling to me in regards to this finding. Overwhelmingly, my students were happier explaining their thinking 10 weeks after the first survey. When I had students compare how they were feeling the first week of school to how they felt at the end of the study period by looking at their surveys, many of them were surprised. Andrew summed it up best in a quote I from my field journal.

> Andrew: I guess, ya know, I guess I used to think explaining my thinking was just, ya know, for you Miss. Chapin. Now, it's more so that Avery knows what I'm thinking so that he can decide if he's thinking that same thing. Then we take our thinking and it makes our math easier. Like, it's, like easier when we use two brains and say what we are thinking out loud. (Field journal, week 10)

The students around Andrew, which I noted in my journal, quickly supported his interpretation on the purpose of student-to-student talk. This experience helped students orient themselves to the importance of the thinking of all students in the classroom.

Partner Tasks Increased Mathematical Content Understanding

Through my analysis of student work, test scores and field notes I found that partner tasks increased students' mathematical content understandings. In Figure 2 I have included the average scores on the EasyCBM mathematics screener for both groups. Having analyzed the data sets I have come to the conclusion that working in cooperative pairs may have influenced the scores on these two assessments. Figure 2 shows the average scores on fall of 2014 as compared to average scores in winter of 2015.

Table 2

EasyCBM Scores

	Fall 2014		Winter 2015	
	AM Class	PM Class	AM Class	PM Class
Average Score	23.6	23.1	26.8	25.8
Maximum Score	31.0	32.0	35.0	36.0
Minimum Score	16.0	14.0	14.0	13.0

Table 2

Looking at EasyCBM scores I noticed that the average score rose 3.2 points for the morning class and 2.7 points for the afternoon class. This is a significant increase especially with the understanding that the afternoon class had a higher instance of students with mathematics IEPs; level 1 English language learners, and students with significant gaps in content knowledge. Due to the overarching nature of the EasyCBM, I compared the average scores for the whole test with the items on the exam that related directly to the unit of study and found that on the five questions that pertained directly to the unit of study the number of students who answered those questions correctly rose by an average of 30%. See Figure 3 for a breakdown of scores by item.

Table 3

Number of Students with Correct Answers

Item (Winter equivalent)	14	15	16 (17)	17(23)	21(22)
# Of Students Correct Fall	43	34	42	43	46
# Of Students Correct Winter	44	36	45	45	47

Table 3

I used these two sets of data to begin coding my field notes and student work for evidence that this mathematics achievement derived from the group tasks and I found multiple places in my other data that helped to confirm my initial idea: partner group tasks may have impacted achievement. I don't have other classes with which to compare but I do know that in my student work I found instances of students applying concepts we had learned in new and interesting ways. In Appendix F there is work from a task in which one partner learned about equal-groups pictures and the other partner learned how to make arrays. This was our first partner task after the T-chart for Fairness had been created. I have included this work because they both increased their EasyCBM scores by more than three points from the fall screening to the winter screening. Their demonstration of fairness and cooperation is what I believe contributed to their success.

In a different example, Nadine was working at grade level in terms of mathematical achievement but she was a metacognitive rock star! She could explain her thinking in multiple ways and always had a creative way to solve a problem. Her partner, Felicity, was diagnosed with autism and had an IEP for mathematics. Felicity worked hard and did her best but was often left behind in the classroom due to gaps in her content

knowledge. Both girls were bilingual in Spanish and English. Looking at their work together revealed their deep and complex understanding of the mathematics. During observations of the first task, I noticed that Nadine felt a need to protect Felicity. I worked with the girls a lot after the first task to help Nadine understand that Felicity had important ideas to offer the class. As we moved forward in the unit and through the tasks the girls began to work amazingly together. Although they did not seem like the perfect pair Nadine's personality paired well with Felicity's. The first task of the data collection period and this was the first time that Felicity was charged with bringing Nadine up to speed with what was going on in the classroom. Looking at my notes from this task I found a quote from Nadine that perfectly sums up the reason this duo worked so successfully together throughout the rest of the study period:

> N: "Felicity, I am going to explain the way I learned from Ms. Appleseed (mentor teacher) and I want you to follow along as I draw my picture. Then, when I am done you can explain your way and then we can ask each other questions if we have any. Does that sound okay with you, or would you like to do it a different way?"

Nadine invited Felicity into the work from the moment they started working together. This continued throughout the study period and their collaboration became a hot topic during the whole group math discussion. Students in my classroom were inspired by their efforts to work harder together. Their interactions were representative of the group as a whole. By working collaboratively on important learning, students increased their content knowledge, which may have transferred to a higher score on standardized measures of understanding.

Student-to-Student Talk Increased Overall Achievement

Through my analysis of test scores, field notes and lesson plans I found that not only were students achieving differently in mathematics they were also more successful in other content areas. Students' scores in areas such as reading increased, student work in writing improved quite a bit, and I noticed the students asking more questions during social studies. Figure 3 shows DIBELS scores for both classes in the fall of 2014 and then winter of 2015. Green signifies a student who has reached benchmark in oral reading fluency and accuracy. Yellow is a student who is approaching benchmark in those areas and red is someone who is well below grade level benchmark in those areas. The retell score is based on how many words the student remembered from the passage that she read right before she was asked to do a retell.

Table 3

DIBELS Scores for 3rd Grade Study Class

	Fall 2014			Winter 2015		
	Green	Yellow	Red	Green	Yellow	Red
Oral Reading Fluency	100wpm	64wpm	41wpm	120wpm	82wpm	51wpm
Accuracy	100%	97%	68%	100%	99%	79%
Retell	77	35	21	54	41	27

Table 3

Students who were green jumped 20wpm while students who were red/red went up 10wpm. Students who were yellow/yellow and red/red also showed impressive jumps in accuracy and retell scores. This kind of growth is not necessarily expected especially in a classroom that has a higher than average proportion of English language learners and

children with special needs. This growth is also interesting because I wasn't consciously working with students to improve their DIBELS scores. I knew they were important and we did quite a bit of reading but what I noticed is that reading time became more about collaboration and sharing than silent, sustained reading time. Students were collaborating while they read and asking questions of each other to improve their ability to retell.

I looked back at my literacy lesson plans for the 10 weeks I was student teaching and found an impressive amount of jotted notes. One stood out to me as I began to see this pattern of improvement. The note read

> Edward and Octavius are not playing around. High level questions are being asked such as "Why do you think Ahmed grabbed the egg in the first place?" and "Would you have let the old lady be mean to Aurelia or would you have stopped her?" Same pair as in math… implications? (Lesson plan, week 4).

The pairings became collaborative in other areas of the classroom and the students' collaboration supported them in pushing each other's thinking in ways that I did not anticipate.

I saw the students consistently applying the Characteristics of Fairness work we did in math to other areas of the classroom. Norms that were initially introduced in the mathematics lessons extended beyond the math classroom and became norms of engagement in all areas of the classroom. I did not expect this to happen and was incredibly surprised to find that I had recorded this occurrence without noticing it at the time.

Implications

Through the process of completing my research many implications have come to mind. I have reflected on the decision I made early on to implement partner tasks with a focus in the characteristics of collaboration, instead of four person group worthy tasks with roles. This decision is what I believe made the biggest impact on my student's success. In the future, in my own classroom, I will implement this system in the same way for the first 10 weeks of school and then begin to move into four person, collaborative group tasks. This system worked for me and it allowed my students the time and space to understand what collaboration looks like in the classroom. In the future I would work with the tasks further, making sure that the tasks I give the students are truly group worthy. Otherwise I think that this set up works and helps students feel supported while pushing their understanding of important math concepts.

Something I found to be invaluable in this process was the amount of practice I did with students on the characteristics. I started setting up the task on Monday and often did not actually have students doing the main task until Friday. This was because the process of creating T-charts, practicing the characteristic with the whole group and doing modeling of right and wrong was important for students as they began the work. This thorough approach to the characteristics as well as the tasks themselves allowed me to gather the data I needed instead of trying to manage my classroom all the time.

The implications of this research on other educators could be incredible. I recommend to any teacher looking to implement this format that patience is the key to making this process work. Allowing the students time to fully understand the characteristics could move fluidly into some work around roles and role cards later in the

year. Take the time to do this right and I imagine the outcome would be incredible.. Increasing student-to-student talk is important, especially as research continues to emerge about student centered education and schools are looking for ways to have teachers talking less and students critically thinking more (Cuban, 2010; Friere, 2000). This new era of teaching and learning is setting the foundations for teachers to think critically about the practices that are implemented in classrooms. The practices laid out here can only be improved upon. I see the pathway of this work making it's way into all of my future explorations. This leads me to questions I would like to explore as I gain experience as a classroom teacher.

Questions for Future Investigation

In the framework I presented, how could I empower students to seek collaboration with their peers without my insistence or orchestrated planning? This question arose from my third finding that student-to-student talk increased overall achievement. I think it could be moved a step further if students were self engaged in highly collaborative tasks in science, reading, writing or art. When students find ways to collaborate perhaps their ability to reason and think critically is expanded and developed. I intend to try to understand how collaboration affects success in a general education Elementary classroom as I move into my own teaching placement and beyond.

Another question that arose as I began writing my findings is a question about measuring student success. I wonder about all of the ways students may have been able to show mastery of a subject, specifically multiplication and division in this case. Could there be an alternative form of assessment that would be more affective in showing student growth across time in the classroom?

Conclusion

Group worthy tasks have been a topic of conversation in the realm of education for many years. From Elizabeth Cohen to Heather Featherstone, educators and theorists have been chasing the same question, how does groupwork impact students' opportunities to learn? I have found that when collaborative learning is implemented intentionally and patiently, group tasks can significantly impact the success students have in all subject areas in an Elementary classroom. I have some questions I intend to understand more fully in the future and I plan to keep working through my understandings as I move into a full time teaching role.

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APPENDIX A

Names _____ Date _____

Miss Chapin was busy this weekend. She decided to organize her books. Miss Chapin's book shelf has 6 shelves and she decided to put 7 books on each shelf. How many books does Miss Chapin have on her book shelf?

Array	***Repeated addition equation***

APPENDIX B

Names _____ Date _____

Mexican Gray Wolves travel in packs of 7 wolves. If there are 9 wolf packs in Northern Mexico how many Gray Wolves are there total?

Array	***Repeated addition equation***
Equal groups or sets	Counting by ***multiples***
Open number line	

APPENDIX C

Kimmy: “We need to make 8 groups of 6? Or 6 groups of 8?”

Cecilia: “Isn’t it two groups?” [draws long pink line and does 2 jumps]

K: “Two groups? Oh! Like Blue and Green table! [starts to label jumps with 6 lines, messes up and blacks out 7th line]

[Student at the table notices their mistake and points out that it’s all the people at the Green and Blue tables.]

C: “Read the problem again? Everybody at Blue table [4 people] and everybody at Green table [4 people] are playing Go Fish! Each person has 6 cards in their hand. How many cards are there in all?”

K: “Oh, so it’s 8 groups of 6.”

C: “How do you know that?”

K: “Because it says *everybody* at green table and blue table, which is 8 total. All of ‘em have 6 cards.”

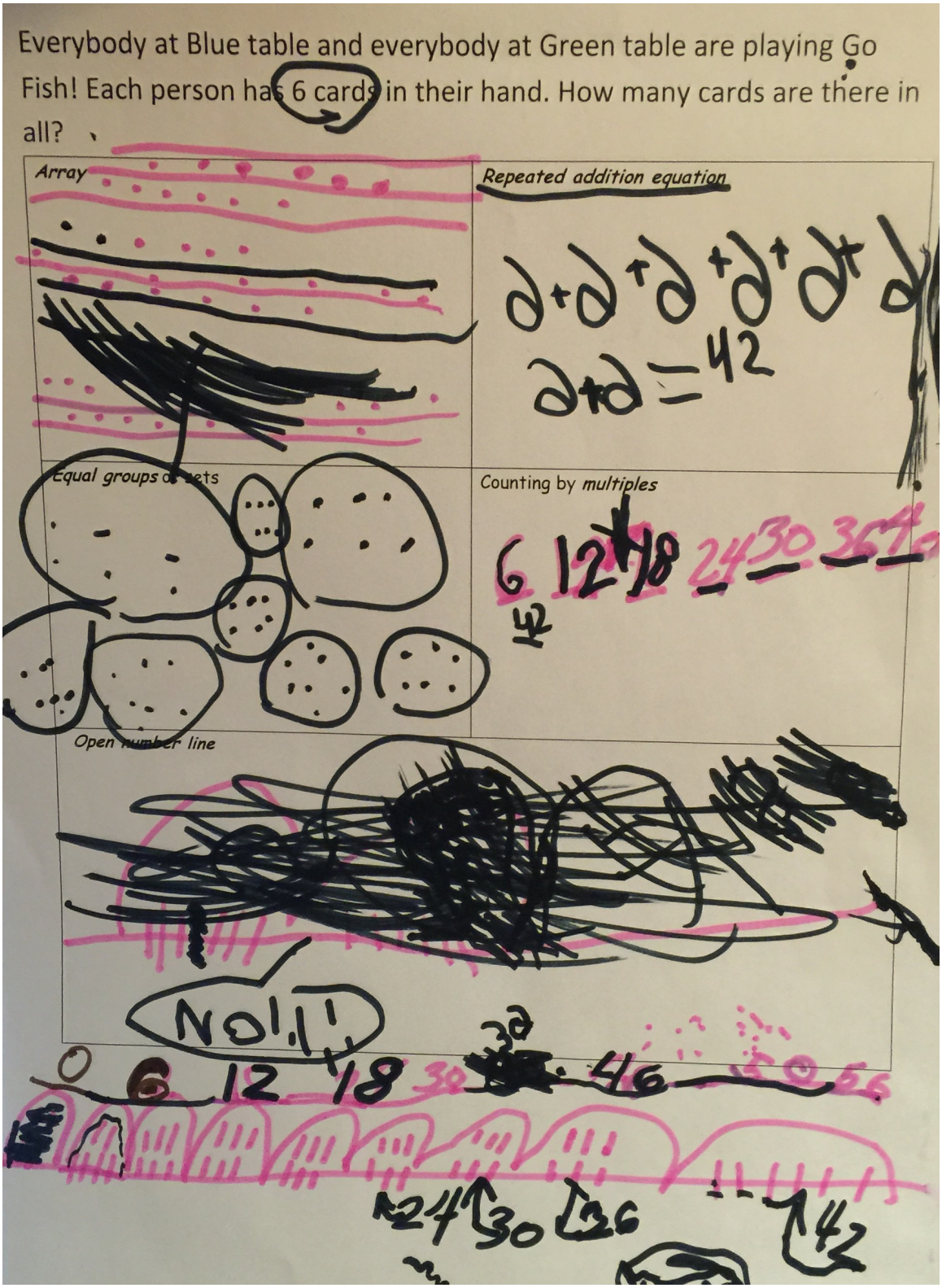
C: “How can we show that on a number line? Like 8’s all the way down?” [Scribbles out previous number line and looks at Kimmy]

K: [draws long pink line and starts making jumps. Stops at 9 jumps] “I think this is it. Like when we add and we make jumps except there’s more inside the jumps.”

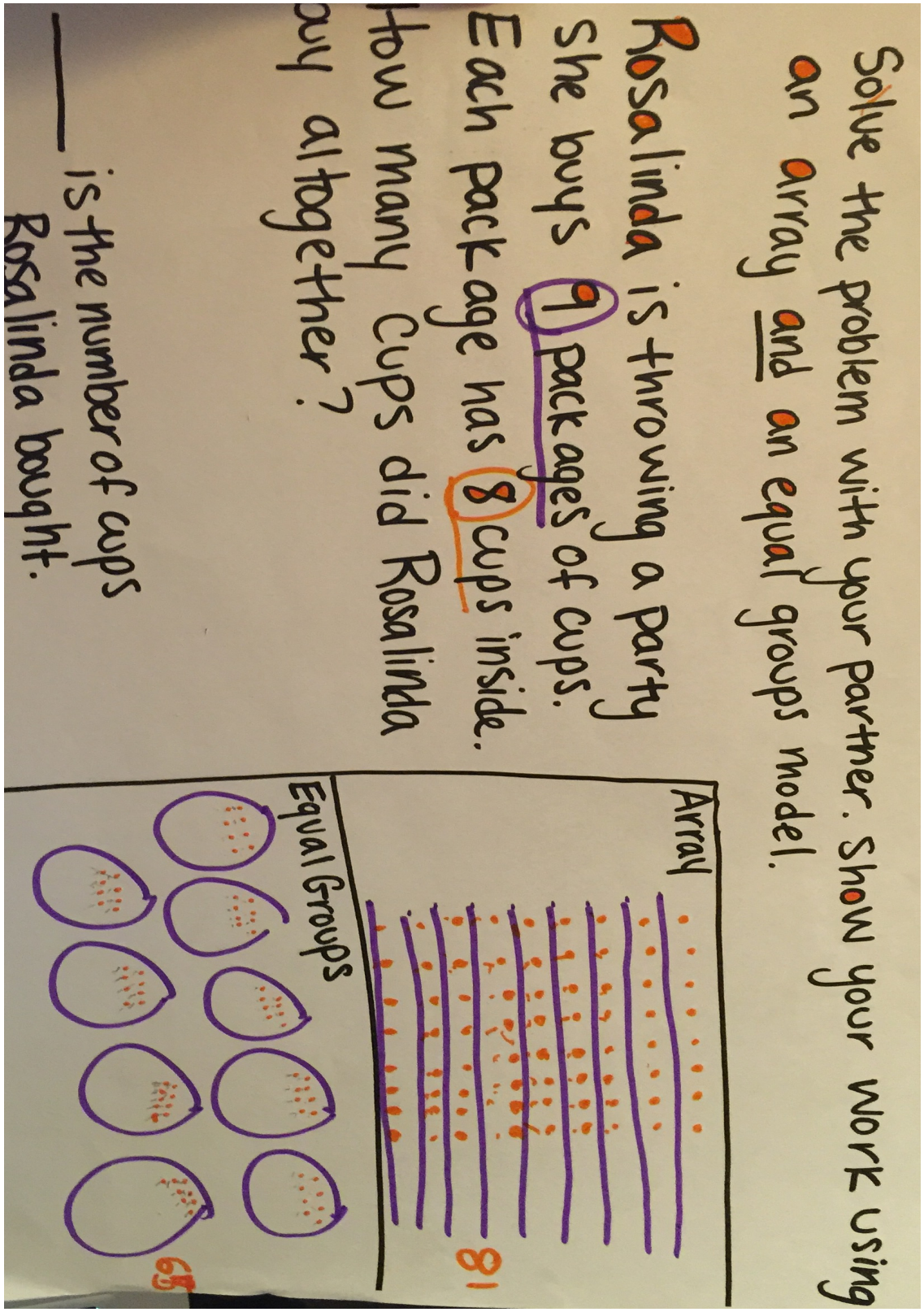
C: “How many in each jump though? Not just 1?”

K: “No, I think probably 6.”

APPENDIX D


Everybody at Blue table and everybody at Green table are playing Go Fish! Each person has 6 cards in their hand. How many cards are there in all?
Array
Repeated addition equation
Equal groups of sets
Counting by multiples
Open number line
No!!!
0 6 12 18 30 46
24 30 36 42

APPENDIX E


Solve the problem with your partner. Show your work using an array and an equal groups model.
Rosalinda is throwing a party She buys 9 packages of cups. Each package has 8 cups inside. How many cups did Rosalinda buy altogether?
___ is the number of cups Rosalinda bought.
Array
81
Equal Groups
72