STUDENTS' EXPERIENCE WITH GROUPWORK IN AN ALGEBRA INTERVENTION CLASSROOM

by

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ABSTRACT

This action research project sought to explore the following question: How does teaching students how to successfully work collaboratively with their peers affect students' perceived mathematics identity and impact their participation? The class in which this research took place was a high school Algebra I Block Intervention class. These students were chosen because, as a whole, they had not experienced success in their previous mathematics classes. Students completed a series of four tasks designed to highlight different skills necessary to complete groupwork. Data sources included two student surveys, my research journal and field notes, video recorded tasks, and student work and reflections. Two overarching themes emerged during data collection and analysis. First, students did not have a clear understanding of what it means to provide help for their classmates and second, these students would not risk their social status to possibly increase their academic status. These findings have the following implications for my future teaching practice: for groupwork to be effective in giving more students access to the mathematics and increasing participation it needs to be a regular part of the class, students need to be explicitly taught how to help their peers, and students need to feel like participating will not put their current status in the classroom at risk.

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CHAPTER 1—LITERATURE REVIEW

Problem Statement

In contrast to other high school subjects, particularly elective courses, the subject of mathematics is often viewed and described by students with a sense of disdain and loathing. When asked what students want in a mathematics class many reply they want mathematics to be fun (Nardi & Steward, 2003). When I questioned students during my practicum internship, prior to my student teaching, about how they liked to learn new things, just under a third of the responses included some mention of fun. The word 'fun' is not especially descriptive. However, students use this term in a meaningful way; research has shown that students see fun and enjoyment as a vital part of learning (Nardi & Steward, 2003). Students learn more when they participate more frequently and the learning is of an active nature (Lotan, 2006). Unfortunately, what I often saw take place in my classroom was students disengaging from the content. Dissatisfied with an approach to teaching that Nardi and Steward (2003) call *quiet disaffection*, students distance themselves from the subject. Nardi and Steward found five major characteristics leading to quiet disaffection in students including: tedium, which is the belief that mathematics is irrelevant and boring; isolation, in which mathematics is described as an individual endeavor; rule and cue following, or the rote learning of a set of rules and procedures; elitism, which posits mathematics as a difficult subject that only few highly intelligent people can master; and depersonalization, which is neglecting to take into account considerations for the students' individual needs relating to the discipline. These five major characteristics of quiet disaffection in students can contribute to low participation among students, which can lead to a lack of learning opportunities. This research made me wonder if the low participation that I viewed during my practicum experience would increase if I found a way to structure my mathematics classroom in a manner that encouraged more active student engagement.

Literature Review

Research has suggested that tedium and rule or cue following may stem from the disproportionate emphasis on memorization and use of algorithms in mathematics classrooms (Nardi & Steward 2003). This may also contribute to the elitism seen in mathematics classrooms where students believe that they can only be good at mathematics if they can easily memorize steps, formulas, and procedures (Schoenfeld, 1988). This is harmful to students' mathematics identity as it instills in them that there are only a limited number of ways to excel in mathematics (Boaler & Staples, 2005). This often leads students to believe they have nothing to contribute during class time and prevents them from engaging with the mathematics. When mathematics classrooms are focused on conceptual understanding and sense making learned through asking questions and explaining reasoning rather than rote memorization, students' mathematics identities begin to change and become more positive (Gresalfi, Martin, Hand, & Greeno, 2008; Horn, 2008; Nardi & Steward, 2003).

Isolation and depersonalization of mathematics, the other two elements of quiet disaffection described by Nardi and Steward (2003), describe the way in which students are often expected to work alone in their mathematics classrooms, a common practice that does not take into account the students' personal needs. By encouraging students to quietly work alone, teachers are effectively cutting off students' resources for learning, causing many to shut down and avoid the subject whenever possible. Because of the highly competitive nature of isolation in a classroom, where students are expected to do work alone but then compare themselves to other students, I observed students in my classroom quickly give up rather than attempt work they were unsure they could successfully complete. For many students, it is less painful to be seen as someone who did not try rather than someone who tried and failed (Gresalfi et al., 2008).

The goal of this action research project was to explore teaching practices that research has shown lead to more equitable learning among students. By balancing the participation in the classroom through activities, tasks, and discussions and observing the effect this has on students' mathematics identities, my hope was to create a more equitable learning environment for all students. By making adjustments to some common teaching practices it may be possible to not only reach students that cause noticeable disruption in the classroom but also the students who are quietly disengaged and not participating.

Identity

How students perceive themselves as learners plays a significant role in their ability to work cooperatively and be successful in the mathematics classroom. These perceptions include how a student identifies as a mathematics student and extends into their socially constructed identities (Esmonde, Brodie, Dookie, & Takeuchi, 2009). Featherstone et al. (2011) described this as the process of *status generalization*, where various characteristics about a student are taken into account and then a certain status is prescribed to the student. For example, a student with low academic status may have a negative mathematics identity (Esmonde et al., 2009; Hodge, 2006). In a study carried out to determine the role student identities played in students' opportunities to learn, researchers found there were themes connecting students' social identities and their preferences in group interactions, their comfort around doing mathematics, and what they thought about working on mathematics with others (Esmonde et al., 2009). Within this study, students who were white tended to take on more leadership roles in group work. Similarly, male students also took on leadership roles in mixed-gender groups. This gave these white, male students significantly more power in the group and increased their overall status. This power imbalance can lead to unequal participation in which marginalized students have restricted access to the content, ultimately widening the learning gap. This happens as the students who participate more learn more while the students with low status, who have less significant roles in the classroom, have less of an opportunity to learn (Featherstone et al., 2011; Lotan, 2006). This research shows that social identity can influence the learning opportunities that students have access to. Unfortunately, a power struggle can easily develop in mathematics classrooms where marginalized students are dominated by their white, male peers (Esmonde et al., 2009).

Students' identification of others is just as important as how they identify themselves. These social identities are complex and influence students' experiences in the classroom. When others identify a student as smart or having high academic status, that student is given more opportunities in the classroom to engage in significant learning experiences (Cohen, Lotan, Scarloss, & Arellano, 1999; Esmonde, 2009; Esmonde et al., 2009). When students are seen by their classmates as less competent or as having low academic status, their ideas may not be valued, which may dissuade them from participating and possibly lead them to become disengaged (Cohen, 1994; Featherstone et al., 2011).

Some students come into the classroom from social groups that make it easier for them to be successful. Schools are typically structured under Lareau's (2011) framework of *concerted cultivation*. Concerted cultivation refers to a style of parenting practiced by many middle class families that encourages and rewards competition and values the skill of being able to communicate effectively with people in power. As a result of the alignment between the education system and these middle class values, school systems may favor middle class children and their families while devaluing the experiences that poor and working class students often bring with them. Students who have been marginalized must work to both learn the mathematics and present themselves as mathematically competent (Esmonde, 2009). These students often carry a low status that has nothing to do with their ability to learn the mathematics. Rather, this low social status is generalized to all areas. Lower-status students may then believe they have nothing to offer their higher-status classmates, leading them to disengage from the work and therefore experience fewer opportunities to show or increase their competence (Featherstone et al., 2011). Unfortunately, these views are not only held by students, but can be held by teachers as well. Fennema, Wolleat, Pedro, and Becker (1981) found that teachers as well as school counselors also have preconceived ideas about who will be successful in mathematics. These ideas are often based on internalized messages about innate ability based on gender and lower enrollment of female students in mathematics courses.

Students in mathematics classrooms also have a mathematics identity. This identity changes within the mathematics classroom context as the student develops certain skills that allow them to participate in a mathematics community (Esmonde, 2009; Hodge, 2006). Research has shown that the way students identify themselves as mathematicians can change according to class participation and can also be affected by the students' self-identity and how others perceive them (Esmonde et al., 2009; Hodge, 2006). If classmates perceive a student as having high academic status, the student may internalize this perception and it becomes part of their mathematics identity (Featherstone et al., 2011).

A study done by Horn (2008) found that access to different identities played a significant role in a students' ability to succeed in school. The study looked at the achievement level of students at two schools, Railside and Greendale. The Railside program placed emphasis on understanding the mathematics. The teachers at the school believed that including a variety of perspectives and abilities enriched the mathematics. In contrast, the Greendale program focused on memorization and getting the correct answer. In an analysis of several students from each school labeled "turnaround students" because of their status as having entered high school underprepared but having succeeded in their introductory college preparatory mathematics course, Horn found that the difference in sustained achievement could be attributed to the identities that were made available to students at each school. After initial success in their turnaround year, the Railside students sustained their success while most of the Greendale students did not.

This study was an extension of the Stanford Mathematics Teaching and Learning (SMTL) Study that compared students' mathematical experiences at two different high schools. Horn used data from that five-year mixed-methods study to focus on the experiences of seven students. She joined the study in its third year and used the SMTL data from the previous two years in addition to her other data collection. The credibility of this study is very high given the amount of time spent at the collection site and the triangulation of data from multiple sources, including interviews with focal students and their teachers, observations of focal students' mathematics classroom and teacher meetings, teacher surveys, and student transcript analysis. Horn also provides rich description of the focal students as well as the two study sites, increasing the transferability of the study to other contexts. In addition, all claims that Horn made can be traced back to a source and confirmed. Given the high credibility, transferability, and confirmability of this study, the study and its findings appear to have high validity.

Students step into their mathematics classroom with ideas about what it means to be good at mathematics and who is good at mathematics; these beliefs play a significant role in students' personal mathematics identities and those of their peers. This manifests itself as the students' status in the classroom, which then has a significant impact on a student's participation (Featherstone et al., 2011). The influence of the teacher can also impact students' understanding of what it means to be good at mathematics. It then falls to the teacher to help broaden students' understanding of what it means to do math (Cohen et al., 1999). When teachers can successfully expand students' understanding, this not only positively influences students' mathematics identities, it also increases the achievement gains in mathematics by positioning more students as competent. This gives them more access to significant learning experiences (Cohen et al., 1999; Esmonde, 2009; Esmonde et al., 2009).

Mathematics in the Classroom

Students' mathematics identities are intertwined with their success in mathematics classes (Esmonde et al., 2009). An unfortunate consequence of this is that these classes often have a narrow view of what mathematics is. Common teaching practices minimize the subject of mathematics to procedures and a fixed knowledge set that only needs to be reproduced. The teaching practices and instructional activities used by teachers can send a message to students about who can do mathematics and what doing mathematics means (Lotan, 2006; Rubin, 2003; Van De Walle, Karp, & Bay-Williams, 2013).

What does it mean to "do math?". The opportunities students are given in the classroom to show their competence is based on what is expected of them. Unfortunately, teachers may have a limited view of what success looks like (Featherstone et al., 2011; Gresalfi et al., 2008; Horn, 2008). When thinking about accomplishment in a class, one cannot limit this view to only consider the student's behavior, participation, and grades. This view must also include what they can do when given opportunities to excel. Gresalfi et al. (2008) observed two different classrooms within the same school that had distinctly different settings and expectations. They considered the cognitive demand of tasks within the classroom, to whom students believed they were being held accountable, and to whom they considered as competent. One of the classrooms was taught by a teacher with extensive experience using *The Algebra Project,* a curriculum designed to help students make connections between mathematics and their everyday lives. In this classroom, the focus was on getting students to decide on the reasonableness of their approach to mathematics and making mathematical meaning. Being fast and correct was not emphasized. Students began to see mistakes and revisions as an expected part of doing mathematics that did not negatively reflect their ability to do mathematics.

The second classroom did not focus on meaning-making. Success in this classroom meant that students could follow directions and obtain the correct answer. Students looked to the teacher as the sole authority and did not see each other as resources for their learning. This approach limited the ways that students interacted with the mathematics and the ways in which they could show competence in the subject. The students who were offered more ways to show their competency had more opportunity to further develop positive mathematics identities for themselves and see that their classmates are resources to them (Gresalfi et al., 2008).

The videotapes used in the Gresalfi et al. (2008) study were from a larger data set collected over the 2001-2002 school year. The classrooms were also visited 10-12 times between January and May. Although the research site was visited multiple times over a five month period which lends to the study's credibility, the article did not go into much other detail about the process of the study. There is very little discussion of the participants and setting, weakening the transferability of the study. The researchers do, however, supply the reader with a description of how their data was analyzed, making it possible to track all claims made back to their source, strengthening the confirmability of the study and subsequently the findings.

One approach to expanding students' understanding of what it means to do math is described by Stipek, Givvin, Salmon, and MacGyvers (2001) as using inquiry-oriented instruction to enhance students' self-efficacy in mathematics. Inquiry-oriented mathematics, which requires student conceptual understanding, encourages the whole class to learn, participate, and engage in mathematics. Having access to the mathematics is vital for students and requires the mathematics to have many different entry points and ways for students to show that they are competent (Featherstone et al., 2001). When students see themselves as competent, other students see them as competent as well, and they become resources to their classmates and are more prepared to engage in important mathematics discussions (Cohen, 1994; Featherstone et al., 2001; Gresalfi et al., 2008).

For classrooms to be equitable, teachers and students must take a broad view of what it means to "do mathematics" and how students interact with mathematics. When there are more ways for students to show their competence they can develop more positive mathematics identities and see that their classmates are a learning resource to them (Featherstone et al., 2011; Gresalfi et al., 2008; Hodge, 2006; Horn, 2008). Students often come into classes with limited ideas about mathematics and who is able to do mathematics, and these ideas are based on prior experiences. It is important to widen students' narrow definition of what it means to do mathematics and who can do mathematics (Featherstone et al., 2011).

Mathematics and social justice. Many researchers argue that, in addition to teaching students the mathematics deemed important enough to be part of standardized curriculums, mathematics in school classrooms should also focus on teaching students to use mathematics as a tool to understand their world (Bartell, 2011; Gutstein, 2003; Gutstein, Lipman, Hernandez, & Reyes, 1997). This branch of mathematics is often referred to as *teaching mathematics for social justice,* where mathematics knowledge is strengthened as students use it to understand and critically view their world (Bartell, 2011).

Gutstein (2003) explored the different components of teaching and learning mathematics for social justice. He found that the environment of the classroom and what the teacher values in the classroom shapes students' understanding of what mathematics is. These results echo the research of Gresalfi et al. (2008) and Horn (2008). One result of the emphasis on high stakes testing in the education system is that students may not approach mathematics with an open mind, believing instead that what they must master is an arbitrary set of rules and procedures needed to pass a test. However, research has shown there are ways this can be changed (Gutstein, 2003; Gutstein, Lipman et al., 1997). One of the primary conditions shown to change this long-held and system-supported belief is when teachers create an environment where important mathematical discussions can occur in the classroom. Students realize that real questions do not always have simple answers and mathematics can play a role in arriving at solutions. Through this understanding students become better problem solvers, can better explain their reasoning, and can communicate this work to others (Gutstein, 2003).

Detracking. In addition to a limited view of mathematics, another factor that contributes to students experiencing a negative mathematics identity is the common practice of tracking students in U.S. schools. Tracking involves sorting and grouping students by their perceived level of competence and essentially resegregating schools (Rubin, 2003). The lower tracks contain a disproportionate number of minority students, which effectively eliminates their chances to engage in more difficult mathematics with (often) more qualified teachers (Burris, Heubert, & Levin, 2006; Horn 2008). In order to achieve more equitable education for all students and help students develop a positive identity around mathematics, some schools in the U.S. have begun the practice of detracking their schools; that is, eliminating the tradition of grouping students into high and low tracks (Horn, 2006; Horn, 2008; Rubin, 2003).

Detracking students is not an option within all schools. This is a decision made by someone with more authority than teachers. However, there are many lessons we can learn from successfully detracked classrooms that can be applied in any classroom. In a study conducted by Horn (2006) of two detracked schools, she found that detracked mathematics classrooms shared a few notable characteristics. The classrooms focused on connections and meaning and the curriculum focused on important mathematical ideas. While some may worry that detracking classrooms will discourage students from taking more rigorous mathematics classes and harm students who are already high achievers, research has shown that is not the case (Burris et al., 2006; Horn 2008). In a study that looked at detracked classrooms, Rubin (2003) found that teachers in these classrooms wanted students to, "get excited, ask questions, and consider big ideas, rather than memorize sets of facts, listen to lectures, or write in a prescribed manner" (p.550). Other successfully detracked classrooms have had similar lesson goals, with the curriculum organized around big mathematical ideas and not terms and procedures (Horn, 2006). Giving students accessible but challenging work and maintaining high expectations without grouping students by ability are ideas that can easily be implemented into individual classrooms (Burris et al., 2006). While teachers must work within the system they are a part of, whether their school is detracked or not, they can build their curriculum around the big mathematical ideas and important concepts and spend less time memorizing formulas. This allows more students access to the mathematics as it can provide multiple entry points for students and various ways to show competence (Featherstone et al., 2011).

In response to the concern about detracking harming high achievers in favor of lower-achieving students, Burris et al. (2006) conducted a study in a school district during a multiyear plan for eliminating tracking at the middle school level. They looked at three cohorts immediately before the reform and three cohorts immediately after. During all the years of the study, the district's racial demographics and socioeconomic population characteristics remained relatively constant and there was little change in the mathematics staff. The researchers found that after the reform, the districts' lowest achievers were exceeding the national average on test scores, and more initially high achieving students were also taking advanced mathematics courses. The same study also found that the percentages of students who did not take mathematics or took mathematics below grade level decreased. This finding refutes the idea that increased rigor from students taking more advanced mathematics courses will lead students to stop taking mathematics beyond their high school requirement and shows that students from all initial achievement levels benefited from the detracking. In one study (Burris et al., 2006) the benefits included a decrease in the number of students who did not take mathematics or took mathematics below grade level; students at all initial achievement levels completed advanced mathematics courses beyond their requirements. Additionally, the percentage of minority students who met the mathematics graduation requirement tripled, increasing from 23% to 75%. Overall, the lowest-achieving students in the study schools still exceeded the national average (Rubin, 2003). In light of these findings, it appears as though detracking may be a promising method of making mathematics classrooms more equitable spaces for all.

Heterogeneous Groupwork

When detracking students is not a viable option, however, teachers can still use the framework of detracking to structure their individual classrooms to be more equitable. Heterogeneous groupwork is one way to accomplish this (Cohen, 2004; Esmonde & Langer-Osuna, 2012). When used effectively, it gives students the opportunity to learn important skills around working collaboratively with peers, allows students to employ their various strengths in tasks that require many different kinds of skills, and it gives students the important experience of working towards a common goal with others (Johnson & Johnson, 1999). However, when not employed effectively, groupwork can reinforce damaging stereotypes and limit access to mathematics for certain students (Chiu, 2000; Rubin, 2003).

Groupwork dynamics are affected by many different variables. Esmonde and Langer-Osuna (2012) explored the power dynamics associated with peer discussions in heterogeneous spaces. They found that when working collaboratively among culturally and racially heterogeneous students, some students have greater access to learning opportunities by dominating group discussions. The students who were marginalized were often from the nondominant racial, cultural, linguistic, or gender groups.

Research by Cohen (1994) has proposed a model of groupwork that attempts to remedy this inequity in the classroom. In an article that describes a created vignette of activities, Cohen et al. (1999) discuss student access to mathematics using Cohen's framework of *Complex Instruction.* Complex instruction tasks are open ended, allowing many different entry points and ways to understand the subject matter. This allows students with varying abilities and skills to contribute and take part in the activity. Students are encouraged to explore different routes to solutions and are expected to communicate effectively with the other members in their group. When using complex instruction, students not only have the responsibility to understand the content themselves but are also held accountable for their classmates' understanding. Johnson and Johnson (1999) found that getting students to work more cooperatively may also lead them to see themselves differently. Because the students are not allowed to depend on a teacher, they found themselves to be more useful, potentially leading them to become more autonomous and independent students as they realized they can contribute in a meaningful way.

Simply asking students to work together in groups is not enough to get the desired result of a more equitable classroom (Francisco, 2012). The complex instruction framework promotes the idea that there are many ways to be good at mathematics and that doing mathematics means more than applying algorithms. This can increase participation as students begin to feel like they have something to offer. As participation increases, student access to mathematics learning also increases.

Research Question

The body of reviewed literature makes a convincing argument for the advantages of broadening students' understanding of what it means to be mathematically competent. Through using cooperative work with random grouping of students within the classroom as a form of detracking students, students can begin to see their contributions as valuable, increasing the positivity of their mathematics identity. By focusing on student understanding and reasoning and the big mathematical ideas while also valuing questioning and seeing mistakes as learning opportunities, students have more chances to be mathematically successful and create a positive mathematics identity.

This action research project sought to explore the following question: How does teaching students how to successfully work collaboratively with their peers affect students' perceived mathematics identity and impact their participation? The central goal was to determine how teaching students to work effectively with their classmates allowed them to engage in mathematics by increasing their reliance on their peers and less on the teacher. When classrooms are structured in a way that expects all students to participate and contribute, students begin to see their classmates as resources with whom they can engage in mathematical discussions, thereby giving more students access to important mathematics. As these students participate more they may come to perceive themselves as more mathematically competent, positively influencing their mathematics identity.

CHAPTER 2—METHODS

Participants and Setting

The setting in which this action research project was conducted was a public high school in a suburban community with a high population of current and former military families. Taubolt High School[1] is the smallest high school in the district, serving approximately 1100 students in ninth through twelfth grade. The surrounding city has a population of about 42,000 and covers a total area of approximately 16 square miles (2010 census data). The school has a more diverse student body than any other comprehensive high school in the area with roughly 50% of the students identifying as European American, 15% Hispanic, 9% African American, 12% Asian/Pacific Islander, 2% Pacific Islander, 10% Asian, 3% American Indian/Native Alaskan, and 10% who identified as two or more races (2012-2013 school performance report data). There is a high rate of student mobility in and out of the school due to the military community Taubolt is a part of and almost 41% of the student body receives free or reduced lunch.

Beginning with the class of 2013, the state graduation requirement for mathematics changed from two credits to three credits. At Taubolt, this meant that all students were required to take and pass Algebra I and Geometry, as well as the standardized state mathematics assessment. Taubolt students can then choose to move forward in one of the two designated mathematics tracks. They can receive their final mathematics credit in either track: the *Algebra II and Beyond* track, which includes the course options of Advanced Mathematical

[1] This is a pseudonym and will be used for the remainder of this paper.

Reasoning, Precalculus, AP Calculus, and AP Statistics, or the *Math Elective* track. If they choose the math elective track they must take a mathematics class that is related to their identified career field and must also have a parent or guardian signature of approval (2014-2016 course catalogue).

The mathematics program at Taubolt takes part in district-wide assessments and follows a strict pacing schedule. This fall the entire district implemented Engage New York's curriculum and followed it closely with the stated goal of measuring its effectiveness. The importance of staying on the pacing guide was often stressed as all Algebra I students in the district took the same test within a specified testing window. All of the Algebra I teachers at Taubolt met weekly, on Fridays after school, to co-plan for the following week, discuss teaching strategies, and share common student misconceptions from the previous week's lessons.

The class that I studied was an Algebra I Block Intervention class. It was comprised of five freshmen and 14 sophomores and had 11 male and eight female students. The demographics of this particular class were not representative of the school as a whole, with an overrepresentation of non-white students and students with Individualized Education Plans (IEPs) and 504 plans, as well as a higher than average rate of absences and tardies. We met during fifth and sixth period every day for two approximately 50 minute classes with a four minute break in between each period.

I selected this group of students for my action research project because, as a whole, these students had not experienced success in their previous mathematics classes, with 14 of the 19 students below grade level in mathematics. This statement is based on the fact that Algebra I is most commonly a freshmen class and 14 students in this class were sophomores. Because of this, a majority of the students experienced low self-efficacy in Algebra and did not see their classmates as viable resources of information, as they knew they had also struggled in their previous mathematics classes. It was common in this class for students to be completely disengaged from the lessons, often claiming they did not understand the work so there was really no reason for them to try. The students' past experiences with mathematics involved mostly direct instruction and included very few opportunities to work collaboratively with their classmates on mathematics. Approximately half of the students were previously in the class Essentials for Algebra, a program that touts itself as being designed for students in middle and high school who are at risk of failing to meet the graduation requirements for mathematics but in its approach does little to prepare students for further mathematics success. With the state graduation requirement of three mathematics credits, sophomores not passing Algebra I will face a difficult road to graduation. It was thus imperative that the 14 sophomores in this class passed Algebra I to maintain an on-time graduation pace.

Teacher Practice: Skills for Groupwork

The students featured in this action research project brought a variety of cultural and personal assets that could not be appropriately utilized under the direct instruction approach, which was the pedagogy they were most familiar with. While direct instruction is not inherently less effective than any other method of teaching, it often limits who is able to contribute and participate in the classroom lesson, as the students have limited opportunities to actively engage with the content of the lesson or with their classmates. Collaborative groupwork is a powerful pedagogical counter to direct instruction; however, as these students were unaccustomed to this style of instruction, they required explicit scaffolding of the norms and expectations when engaging in groupwork. This study was intended to help prepare students to successfully complete groupwork, a more equitable pedagogical approach as a means to increase participation and help students foster a more positive mathematics identity. Merely assigning students to groups and then asking them to collaborate will not solve the problem of inequity in the classroom. Even worse, poorly structured groupwork can exacerbate the problem by reinforcing damaging stereotypes and further limiting access to mathematics for certain students (Rubin, 2003). In order to avoid the common pitfalls of groupwork, students in this class completed group tasks that taught them how to be successful while working with their peers. These tasks were selected to show the students the ways in which the varied assets they brought into the classroom could become valuable resources for their classmates while also encouraging and often demanding participation by all students.

Before beginning each task, the students were randomly assigned to groups using a standard deck of playing cards. The groups typically consisted of three to four students. On several occasions the classroom teacher and occasionally a paraeducator were members of a group while I observed all of the groups throughout each task. The students completed four total tasks over the course of two weeks, with each task taking between 15 and 30 minutes to complete. After completing the task, students would respond in writing to one or two reflection questions. These reflections were completed twice as individuals and twice as a group. Students were asked to list skills that were necessary to complete the task or write down what skills were necessary for this task that were not necessary in the previous tasks.

After all four of the tasks were completed, we had a whole group discussion on what the students wrote down as the necessary skills. From this conversation, we compiled a list of skills necessary to work successfully with peers. We then discussed how each of these skills was important and how being good at mathematics included the ability to effectively demonstrate these skills.

The purpose of these activities was to increase student participation. Increased student participation can potentially increase the number of positive mathematics identities. It can also increase the achievement gains in mathematics by positioning more students as competent, although achievement gains were not something I examined in this study (Cohen et al., 1999; Esmonde et al., 2009; Esmonde, 2009). After students had completed all of the skill-building tasks and engaged in the subsequent skills-based discussion, they were asked to identify which skill they felt they could most easily implement the next time they were asked to work collaboratively with their peers. The following day, students completed a partner activity and were asked to focus on their previously identified skill. At the close of the activity, students were asked to reflect on their success at implementing the skill and identify what they would do differently next time. This process was repeated once more, with students completing a second partner activity and writing about how they used a different skill than they had in the previous partner activity.

A Description of the Tasks

Four different tasks were utilized in order to build skills for groupwork: *Lots of Dots, Master Designer, Broken Squares* (Cohen, 2014), and *What Shape?* (What Shape? 2015). Each task was designed to highlight different norms for groupwork in order to give students the tools they need to effectively work with their classmates.

Lots of dots. The first task this class completed was called Lots of Dots. For this task, students worked in larger groups of six or seven, and each student was dealt four to five cards from their group's deck. The students were not allowed to show their cards to any other member of their group. Figure 1 shows an example of the cards a student may have been dealt. All of the cards in the deck had at least one exact match expect for one card. The groups' goal was to figure out which card had no match. Because the students could not show each other their cards, they could not complete the task unless every member of their group shared information, described accurately, and listened carefully. This was the primary learning objective for this task.

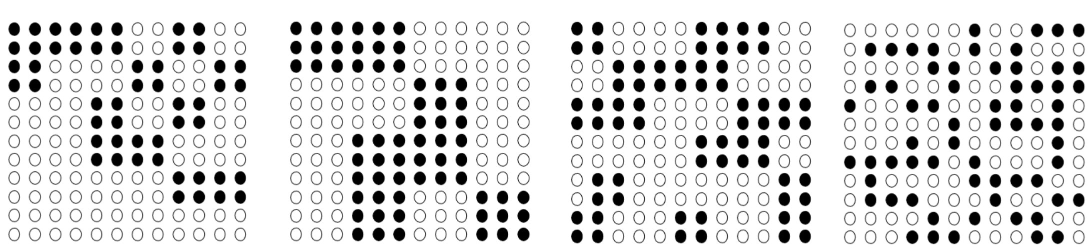

Figure 1. An example of cards a student may have been dealt.

Master designer. The second task that students completed was called Master Designer. In this task, each student received a set of the same shapes and a privacy folder to prevent students from seeing each other's design. One student in each group was assigned the role of Master Designer. The Master Designer used the given shapes to create a design but could not let any other members of their group see it. They then had to describe the design to their group while the other members attempted to create the design accurately using their own collection of the shapes. The goal was for each student to end up with the same design in front of them. The task was not complete until all group members had the same exact design. However, if one group member correctly completed the design, they could then help the other group members by asking and answering questions about the design. To be successful in this task, each group member needed to help the others, ask questions, and explain by telling how shapes needed to be moved or rearranged to construct the correct design. These were the norms developed through the Master Designer task.

Broken squares. For the third task, students completed a task called Broken Squares. I knew prior to giving the task that it would be the most challenging for my students to complete, as the main rule in this activity is that there is no talking. The goal of the task is for each student to build an identical square after being given a variety of shapes. At the start of the task, all students received an envelope with different shapes inside to help them construct their square. Some student's envelopes had the correct shapes to build a square immediately; however, their classmates could not construct their own squares unless this person took their square apart and shared the pieces with other group members. The challenging part of this activity was that students could not speak at all, which meant they could not ask for a specific piece from their classmate or tell their classmate where to put their pieces. All they were allowed to do was give pieces away to another student. This task was not complete until all members of the group had identical squares in front of them, which made it vital that the students paid attention to the needs of their classmates, which was the primary learning objective of this task.

What shape?. For the final task, students completed an activity named What Shape?. During this activity, all but one member of the group chose a shape from a list that was accompanied by a picture. The other group member had to ask questions in order to discover what the chosen shape was. The guesser was only allowed to ask yes or no questions and could only guess what the shape was three times. The rest of the students were responsible for coming to a consensus on how to answer the yes or no questions. Groups could only be successful in this task if they asked questions, reflected on the answers, and made use of what was said. These were the norms that students learned from this task.

Closure

After students completed Lots of Dots they brainstormed as a group a list of skills that were required to complete the task. The lists were long but unfortunately not very specific to the task they completed. In an effort to help students respond in ways that were more specific to the task, I changed the directions for reflection before the second task, Master Designer. Instead of responding to the open-ended question from the first reflection, each student in the class came up with one specific skill that was necessary for this task that was not required for the first. Students had to hone in on what was different about the two tasks, which ultimately produced much more specific answers. After completing Broken Squares, students were asked to individually come up with one skill that was crucial for that task that was also necessary in another task and provide the name of the other task. They were then asked to identify a skill that was not vital to the other two previously completed tasks but had been important in this task. After the final task What Shape?, students worked in their groups to name any essential skills.

Once I had all of these lists from students and groups I compiled them into a master list of necessary skills for effective groupwork. We had a class discussion on the list and as a group, a shorter, more concise list emerged that included the following as skills essential for groupwork: sharing information, everyone contributes, describe accurately, listen, pay attention to what others need, no one is done until everyone is done, explain by telling how, everybody helps, ask questions, and reflect on and make use of what’s been said. The students then completed two follow-up activities where they had to identify and use at least one of these skills to complete their mathematics task and write about how they used it.

Data Collection and Analysis

This was a qualitative research study where I acted as teacher-researcher. This action research project took place during my student teaching, a requirement of my two-year Master in Teaching program. I collected data steadily over the course of three weeks. These three weeks occurred two months into the school year. During the data collection timeframe, my only responsibility in the classroom was to conduct my research, as the classroom teacher had taken back over the full time teaching responsibilities. Although I did not officially start collecting data until well into the school year, I was still able to capture students' initial beliefs and understanding related to working with their classmates and their own identity around mathematics by administering a survey to all students prior to data collection. I also kept a detailed research journal throughout all ten weeks of my student teaching, documenting observations around student dispositions and interactions with others in the classroom. This research did not examine potential achievement gains with these students but rather attended to participation levels and any changes in mathematics identity related to working individually or with peers.

Student Surveys

Students were asked to fill out surveys twice during the study. The first time was roughly six weeks into the school year to obtain information about students' initial perceptions around participating in mathematics classrooms, working with their classmates, the usefulness of their classmates to their own learning, and their perceived ability and identity as a mathematics student. At the end of the research process I gave the students a similar survey to see if or how their ideas changed. The surveys were not anonymous because I wanted to be able to compare individual student changes as well as overall changes (see Appendix A and Appendix B). Student responses to the surveys were analyzed through coding and memoing, and categorized to develop themes (Anderson, Herr, & Nihlen, 2007; Mertens, 2010).

Research Journal and Field Notes

Because I was in the position of being both the teacher and the researcher while conducting this study, it was important for me to thoroughly document the happenings in the classroom and my initial thoughts and ideas around those. A main goal of mine was to pay attention to and document student participation during activities. This helped me keep track of when it appeared students were on task versus when they were not. This came naturally from some of the other notes I kept. I also recorded what I sensed to be the frustration level in the class, particularly how they solved problems themselves and moved forward. It was important for me to pay attention to who was being heard in groupwork activities and who had the opportunity to contribute. My journal and field notes allowed me to capture moments as I experienced them and then compare those notes to other forms of collected data. This gave me multiple viewpoints to look at particular moments that had occurred in the classroom.

Video Recorded Tasks

I video recorded a single group during each group-building task and during both partner activities. By recording at least one group during each task, I was able to compare changes over time within the classroom, particularly in regards to student participation, time on task versus time off task, and the ways in which students were and were not using each other as resources. Relevant portions of these videos were transcribed and the transcriptions categorized. Transcriptions were analyzed and coded to develop themes (Anderson et al., 2007; Mertens, 2010). Both student and teacher comments were coded and categorized and the themes within the data emerged naturally. These categories were refined throughout the data collection phase. The recordings also offered a source with which to compare my field notes and research journal. This allowed me to compare my real-time perceptions about what was happening in the classroom with what I saw on the video recording, as there were differences between what I experienced as a student teacher and what my students experienced.

Student Reflections and Work

Student reflections were collected after each groupwork task and student work was collected after the two subsequent partner activities. These data sources provided yet another way for me to check my assumptions of what I saw in the classroom and compare them with what my students were experiencing during the tasks. Data collected from student work and reflections provided a method for including the entire class in the analysis process to look for patterns that may have occurred throughout the class. Student reflections and work were used to draw connections between the different data sources after each task was completed.

Quality Indicators

While conducting this action research project, there were several external factors that impacted both the data collection process and my ability to draw conclusions from analysis of this data. While the data I collected differed slightly from my original intentions, I was still able to effectively address my research question.

Limitations

Although I was in the classroom with these students for a total of 13 weeks, data collection only occurred over a relatively short time period, spanning only three weeks. One of the main limitations of this study was that it was completed after my student teaching was officially over. Because of expectations of the classroom teacher, I was unable to complete the skillbuilders at the beginning of the year, which is when I would have preferred. By having the students complete these tasks early in the year it could have helped set norms in the classroom that would have better prepared them to complete groupwork. Because my goal of this research was to increase participation which is directly connected to students' mathematics identity and status in the classroom, it would have been beneficial to have more time for the students to internalize the norms. This lack of time made it difficult to see any changes in mathematics identity or increased participation.

Completing my research after my official student teaching also meant I had no control over what occurred during the class at any time other than when I was there to collect data. Because of this I had very little buy-in from the students, as they were not utilizing the skills they were practicing during the skill building activities in their everyday mathematics lessons. They also seemed to experience my time with them as a break instead of a time to work on valuable skills. If I had the chance I would have begun my research on the first day of school so that my students saw these activities as a regular part of doing mathematics. I also would have been able to reinforce these ideas by utilizing the skills students practiced during class.

A further limitation included the writing and reading ability of the students in this class. According to student records, the majority of the class was reading below grade level, with many as low as a fourth or fifth grade level. This meant that I did not get as much information about students' perception of their mathematical identity as I would have liked to, as their survey answers were often only one to five words long and thus did not go into very much detail. I could have addressed this by conducting a short verbal interview with these students and asked more probing questions when they supplied short answers. However, due to time constraints around my data collection, student interviews were not a realistic possibility.

I also did not collect any data from students that was anonymous. All of my data sources either had the student's name on them or it was clear from the video who it was. This may have limited the conclusions I was able to draw, as students might not have felt comfortable to respond honestly. Students might simply have given the response they thought I would want to hear. This limitation was partially addressed by the fact that I was no longer the students' classroom teacher and had little authority over them during this time.

Strengths of the Study

This study featured a relatively small sample size as class enrollment in an intervention mathematics class is kept purposefully low. However, the smaller class size allowed me to provide a rich and detailed description of my students and their past experiences with mathematics. I also provided a detailed description of the tasks that were used and how the study was adjusted as time passed. This level of detail allows the reader to assess the transferability of the findings.

Collecting data directly from students, including their work and task reflections, increased the credibility of my interpretations of the students' experiences. I also engaged in a formal peer debriefing during the coding and analysis phase, further increasing the credibility of my findings. Credibility is also strengthened by the multiple data sources I used while conducting my research, including two surveys, video recorded class sessions, research journal and field notes, as well as student work and reflections.

In order to strengthen the dependability of my research I kept a research journal documenting any changes in the focus of my research question and data collection methods. As time passed during the data collection phase I realized that I was not getting as much information about the students' mathematical identities as I initially thought I would. Due to this, the focus of the study shifted more towards what students thought about working with their peers and how this might be affecting their participation.

To strengthen the confirmability of my study I attempted to make the entire research process as transparent as possible. I provide a clear sequence from data collection to findings. I also participated in the process of an external audit with someone who was familiar with my research topic but not my classroom or students. My peer drew similar conclusions after reviewing my data.

CHAPTER 3—FINDINGS AND IMPLICATIONS

Findings

Two overarching themes emerged during the data analysis process. These themes have major implications for my ability to successfully implement groupwork as a way to make my classroom more equitable, which was the primary goal of this research. The first theme was that students had a different understanding of what it meant to provide help for their classmates than I had anticipated, one that limited their groupwork interactions rather than increased their interactions. This theme was initially present in students' survey responses and then reinforced throughout all the remaining data sources. The second theme that emerged from the data was that in this class, students' social status outweighed their academic status. This became apparent through observing and noting student interactions with each other throughout the research process, as well as while analyzing the video recorded tasks. Both of these themes highlight vital concerns that I will need to consider as a mathematics teacher.

Student Beliefs Around What it Means to Help Others

A theme that appeared throughout the data collection and analysis process was that students did not have a very well-developed idea of what it meant to help their classmates. They often wrote about their disposition towards being helpful but in practice they had minimal understanding of what that involved. This is in line with literature that explains that students do not know how to work together until they are explicitly taught how to do so (Cohen, 1994; Francisco, 2012). This spirit of wanting to help was present in students with varied levels of current ability, confidence, and social and academic status. If students want to be helpful regardless of their current identity as a mathematics student, then this seems like an important place for me to invest energy by helping students become resources for each other.

I first began to question whether or not students knew what it meant to help each other when reviewing the first survey they completed. In survey question nine (see Appendix A), I asked students what they thought their responsibilities were when working on math with their classmates. Besides leaving the answer blank, which I think also communicates a lack of understanding of what it means to help, the most common response was that they were expected to help their classmates. In the majority of those answers, the student did not go into any detail about what helping meant. In the two cases where the student did give an explanation, the explanation was minimal and included the statements “come together with the answer and know we’re right” and “give answers”, both of which are not how literature would describe students helping each other (Cohen, 1994; Esmonde, 2009).

This same idea of helping resurfaced again in question 10 of the same survey. I asked students what skills they brought to a group when they were working with their classmates. Besides listing that they had no skills or the opposite, many skills—with no explanation and lots of sarcasm—students said that helping was a skill they possessed. Each time that helping was mentioned in the survey it was presented as if I should know exactly what they were referring to. This led me to wonder if they even knew what they were referring to or if they were saying it because they thought it was what I wanted to hear.

I questioned students' understanding of what it means to help each other for a few reasons. The first reason was that I had already spent over 10 weeks in the classroom with these students and saw firsthand what helping seemed to mean to them. When they asked for help from me, the classroom teacher, or their peers, what they typically wanted was the answer. The other reason I questioned their understanding of what helping was came from their answers to question eight in the same survey. In this question, I asked students if they would rather work on math alone or with their classmates. Only five students said they preferred to work alone while nine said they wanted to work with their classmates. This surprised me because it was not what I had experienced in the classroom as a student teacher.

In both the initial and final surveys, the majority of students claimed to want to work together. In practice, however, this was not what took place in the classroom. Asking students in this class to work with their peers was met with a high amount of student resistance. This led me to wonder what students thought it meant to work together or help their classmates since their actions did not match up with their claims. The students who described why they wanted to work together mentioned ideas related to it being more fun, allowing them to check answers with each other, or having their classmate give them the answer. At least two of those responses meant that the students were not actually working with each other, while the response referencing an increase in fun did not necessarily imply that any math was getting done either, just that the students were enjoying themselves. While it is true that students can have fun while working on mathematics, which is in fact what I hope to someday accomplish in my classroom, I do not believe this is what that particular response was referring to.

In addition to this theme appearing in my surveys and field notes, I also noticed this in the video recorded tasks that my students completed. During the task Master Designer, students were required to keep their work behind a folder so that no one else could see it. From the video, I saw students just pick up shapes and show their group members rather than try and explain the shape. I also saw some students look around the folder to see the Designer's shapes, and some students reaching over and moving their classmate's pieces. All of these actions go against the rules for the activity around how students can help their classmates. However, these actions line up with how students are often seen helping their peers, either by doing it for them or by copying someone else's work.

This way of helping showed up similarly in the Broken Squares task. Because the students were not supposed to talk during this task, they were expected to help each other by paying attention to what their group members needed and then supply that piece if they could. The only group that followed this rule was the one that the classroom teacher was a part of. In the other groups I captured on video, students are seen taking pieces from classmates, asking for pieces that they wanted, and in an extreme case, one student in a group took all of another group member's pieces and constructed both his and her own squares.

A second problem that groups encountered during this task was that although they were informed that their group was not finished until all members had an identical square in front of them, once one student in a group had a square they would claim to be finished. These students would then refuse to take their own square apart, even though that sometimes meant no one else in their group could successfully construct their square. Here, students' previously-stated desire to help each other came second to completing their own work. Students were overheard saying, "I don't care—I have a square so I'm done" and, "They're on their own—mine's finished." While I reminded the students that they were working as a team and could not be finished until all members of the group had a square, this did not prevent students from hoarding their pieces. During the short debrief of the activity, I asked students to explain why they had not wanted to break apart their squares, even though it prevented their group from finishing. Several students reiterated that they believed they were done and did not care whether or not the rest of their group members were able to finish. From this debrief it seemed clear that while many students' survey responses indicated a desire to help their classmates, this desire was only present if it did not affect their ability to complete their own work.

During the two partner tasks at the end of my data collection, it was evident from my field notes, video recordings, and student work and reflections that the students still relied heavily on poor groupwork habits. Students had the tendency to take over for the peer they thought they were helping. Students also ignored the problem that was being asked in favor of a simpler alternative that did not actually answer the question. They also ignored rules and expectations, which made it unlikely that they would finish the task and simply took the cooperation aspect out of the task.

While most of the students did not succeed in completing groupwork during this short time period, research has shown that getting students to work more cooperatively can lead them to see themselves as more autonomous and able to contribute in a meaningful way. This can increase participation, allowing more students access to the learning (Cohen, 1994; Johnson & Johnson, 1999). Based on this and the fact that students cannot be expected to work cooperatively without being taught explicitly how to do so (Francisco, 2012), I will need to designate significant class time to working on skills for successful groupwork. It was clear in my classroom that students did not know how to do this.

Although I was unable to devote the time I would have liked to cultivate the skills required for groupwork, I know that until students are taught how to do this, my classroom will not be as equitable as it should be. Groupwork is an effective tool for lowering students' affective filter, as it provides them with a more supportive environment in which to ask questions and be understood (Cohen, 2014). Groupwork can help give lower-status students access to the learning and allow them to increase their academic status. However, this can only work if students are in an environment where they feel like asking questions and trying out new ideas will not jeopardize their current status level.

Social Status Outweighs Academic Status

The second theme that appeared throughout the data collection and analysis process was that, for students in this intervention class, their need to maintain their social status outweighed their need to increase their academic status. To clarify, when students felt like their social status was in jeopardy because of a mistake they made or a question they asked, they preferred to keep their social status intact and avoid the possibility of impacting their academic status. The identity that these students carried forward from previous classes became a part of their identity and it clearly affected their participation in this class. Because this was an algebra intervention class, the students generally saw each other as having low academic status, which made their social status vitally important to them.

Since status plays a significant role in the experience of students in the classroom and can impact their participation, students wanted to hold onto whatever status they had (Cohen, 1994; Featherstone et al., 2011). For many of these students, this was not their first intervention class, and the experience of being repeatedly tracked into intervention classes had negative effects on their student identities. These students already had low academic status and were unfortunately being sent the message that they were not good at mathematics. These intervention classes had a limited view of what it meant to excel in the subject and rarely utilized the various assets these students brought into the classroom.

The students in this class likely had very little previous experiences with their assets being valued in the classroom by the teacher. Because of this, they may have developed strategies for protecting what was valued in the classroom by the other students, which in this case was their social status. In this particular class, this seemed to manifest itself as students avoiding work when they were unsure they could complete it. I was aware of this theme in my classroom even before I began my research, but it was further highlighted throughout the data collection and analysis process. During the skill building activities, students employed a variety of strategies to avoid completing their work. From the video recording of the first task, students could be heard saying, "I suck at this game" and, "I don't want to do this." Comments like these were followed by students attempting to disengage from the activity in one of two ways. Students either tried to give their cards away and leave the group altogether or they sat silently with their group yet did not attempt to actively participate in the activity. Similar phrases can be heard on the video from the other tasks, including, "I can't do this shape," "This is lame," and, "This is dumb—I can't do this." Because these tasks challenged the students' perceived status level by asking them to use skills they rarely employed in this class, they were hesitant to participate. It appeared that they would rather avoid the activity completely and not risk their current social status by making a mistake or actively making the task more difficult for their peers. It may have been easier for students to be seen by their peers as someone who did not try rather than someone who tried and failed (Gresalfi et al., 2008). The students appeared to take ownership of the identity of someone who was not skilled in mathematics and then tried to highlight the positive aspects of their identity.

A similar pattern emerged from the video recorded partner tasks that were completed at the end of the study. A variety of avoidance techniques were used and in one case, a recorded group was seen working on the mathematics problem for only three of the given 25 minutes. Another student was heard repeatedly saying, “I don’t care” throughout the entire task, while other students could be heard saying, “I don’t know how” and, “I can’t even start” in very frustrated tones. Phrases like these were used regularly by the students in this class as a way to avoid completing work. By claiming that the task was too difficult for them to complete or that they did not know how to start, they were able to maintain their social status by preventing the opportunity to fail. However, in doing so, students also limited their opportunities to increase their academic status by trying out ideas, making mistakes, and revising their thinking (Featherstone et al., 2011).

After reviewing the student work they submitted for the partner task, it was confirmed that many of the students had barely attempted the task. There were many blank recording sheets turned in and limited explanations given when work was provided. While it may have been true that the partner tasks were too difficult for some pairs to finish, the majority of the students immediately decided that they could not complete the task after hardly reading the directions. An entry from my research journal after the partner task lesson included a note that many pairs of students told me they did not know what to do before they had read the question in the task.

Having spent a little more than 13 weeks with these students I have come to recognize the need to maintain their social status as an important part of the culture of these students. Through completing this action research I realized that while there are multiple reasons why my students avoided doing work, issues around status in the classroom was a significant factor. Because groupwork is such an effective tool for helping lower-status students increase their status, it would greatly benefit students to engage in more groupwork activities. When used correctly, collaborative groupwork can give students a supportive environment to increase academic status without challenging their social status. However, it is important to recognize that when students are repeatedly in classes where many of their assets are not valued, they may cling to the assets that are valued, and this can negatively impact their participation in academic activities.

Implications for Future Teaching

The experience of conducting this action research project assisted me in identifying several classroom practices that I will need to implement with my future students. Based on both the synthesis of ideas from my literature review and findings from my research, three overarching implications for my future teaching emerged. First, for groupwork to be effective at giving more students access to the mathematics and increasing participation, it needs to be a regular part of the class. Second, students need to be explicitly taught how to help their peers. Finally, students need to feel like participating will not put their current status in the classroom at risk.

Groupwork as a Regular Part of the Mathematics Curriculum

Groupwork needs to be a regular part of my classroom practice if it is going to successfully provide all students with increased access to the mathematics. Sporadic or unstructured implementation of groupwork practices may instead reinforce damaging stereotypes and further limit access to mathematics for many students (Chiu, 200; Rubin, 2003). When students regularly participate in well-structured groupwork they have the opportunity to learn important skills around working collaboratively with peers, showcasing their strengths in tasks that require many types of skills, and working towards a common goal with their classmates (Johnson & Johnson, 1999). Research explains that simply asking students to work together in groups is not enough to get the desired result of a more equitable classroom (Francisco, 2012). This was very clear in my classroom, as the findings showed these students did not know how to work together or help one another. I also found that a further condition was necessary. Not only did my students need to be taught how to work in groups, they also needed frequent opportunities to practice these skills. Cohen (2014) explains that for students to work effectively in groups, they need time to internalize the expectations of groupwork so that they will hold each other accountable to them.

One of the limitations I described in chapter two was that I completed my research after my official student teaching was over. This meant, as the classroom teacher had taken back over full-time teaching, my only time with the students was while I was collecting data. I had little opportunity to reinforce the importance of skills for working with your peers, and the students had limited opportunities to try out the skills I was attempting to instill in them. The students seemed to experience my time with them as a break rather than a time where significant learning was taking place. By making groupwork a regular practice in my classroom, students will be able to better experience and understand its usefulness.

Explicitly Teaching Students How to Help

Both the reviewed literature and my findings support the need for spending class time teaching students how to help each other. As research states that students do not know how to help their classmates unless they are explicitly taught how to do so, I will need to attend to this in my future practice (Cohen, 1994; Francisco, 2012). While knowing how to provide help is necessary for successful groupwork, it is also essential for other classroom activities.

During my experience as a student teacher, there were many times throughout the day when I asked students to help their classmates. I wanted the students to see each other as resources, partly so they would not rely so heavily on me, but also because I know that talking about the mathematics helps students complete the learning cycle described by Zull (2002). It gives them an opportunity to actively test out the new material. While this is not considered formal group or partner work, for my students to benefit from working with their peers, they still needed to understand what it meant to help their classmates. I would like to further explore how students who have internalized the necessary skills for groupwork are able to transfer those skills to other contexts and successfully apply them.

While the classroom teacher was hesitant to take time at the beginning of the year to teach groupwork skills, I believe that the long term benefits would have made up for the loss of initial content instruction. If students can successfully help each other rather than just provide the answer or describe what they did with no explanation, it will give me more time to monitor student progress, look for common misconceptions, and ask more high-level questions. Students can also increase their proficiency and gain a deeper understanding of the content by engaging more actively with it (Lotan, 2006).

Status and Participation

Groupwork, when used correctly, can have many positive effects on students by providing them with a supportive environment in which to ask questions and be understood (Cohen, 2014). However, what I found during my research was that my students, who all had relatively low academic status from being placed in an algebra intervention class, would not risk their social status by participating in something on which they might not perform well. There was a strong connection between the students' status and their participation.

A student's mathematics identity can come from them internalizing ideas about status in the classroom. Students with low academic status likely see themselves as being bad at mathematics (Esmonde et al., 2009; Hodge, 2006). In the class I researched, that often meant they avoided the work so that they would not risk looking like they tried something and failed, keeping their social status intact. Unfortunately, because I had a class full of students with low academic status, it was often difficult to get them engaged in academic work. From the literature I reviewed, I know that groupwork, when implemented properly, can help address this problem; however, I was missing certain conditions in my classroom that would have helped the students feel like they were in a supportive environment where their status was never at stake.

While students did learn skills for working cooperatively with their classmates, it is not likely they truly internalized any of them, as they were not provided the time to do so. In my future teaching practice I plan on continuing to implement practices aimed at increasing both participation in the classroom and the number of students with more positive mathematics identities. As I do this I will attempt to address the findings from this action research project. First, that students need to be explicitly taught how to provide help to their peers, and second, that issues of status influence students' mathematical identities, which can then get in the way of students' opportunities to learn.

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APPENDIX A

Data Collection Initial Survey

Name____ Date ______________

For questions 1-6 circle the word that most closely describes how you feel about your mathematical ability individually, with a partner, and in a group.

1. Use the scale to describe your feelings when working **individually** on math problems

1: Hopeless 2: Unsure 3:Capable 4: Confident

2. Use the scale to describe your feelings when working **individually** to learn new concepts in math class

1: Hopeless 2: Unsure 3:Capable 4: Confident

3. Use the scale to describe your feelings when working **with a partner** on math problems

1: Useless 2: Occasionally helpful 3:Productive 4: Valuable

4. Use the scale to describe your feelings when working **with a partner** to learn new concepts in math class

1: Useless 2: Occasionally helpful 3:Productive 4: Valuable

5. Use the scale to describe your feelings when working **in a group** on math problems

1: Useless 2: Occasionally helpful 3:Productive 4: Valuable

6. Use the scale to describe your feelings when working **in a group** to learn new concepts in math class

1: Useless 2: Occasionally helpful 3:Productive 4: Valuable

7. How would you describe your mathematical ability?

____

____

____

8. Would you rather work on math problems alone or with your classmates? Explain

____

____

____

9. When working on math with your classmates, what do you think your responsibilities are? ____

____

____

10. When working on math with your classmates, what skills do you think you bring to the group?

____

____

____

APPENDIX B

Data Collection Final Survey

Name____ Date _______________

For questions 1-6 circle the word that most closely describes how you feel about your mathematical ability individually, with a partner, and in a group.

1. Use the scale to describe your feelings when working **individually** on math problems

1: Hopeless 2: Unsure 3:Capable 4: Confident

2. Use the scale to describe your feelings when working **individually** to learn new concepts in math class

1: Hopeless 2: Unsure 3:Capable 4: Confident

3. Use the scale to describe your feelings when working **with a partner** on math problems

1: Useless 2: Occasionally helpful 3:Productive 4: Valuable

4. Use the scale to describe your feelings when working **with a partner** to learn new concepts in math class

1: Useless 2: Occasionally helpful 3:Productive 4: Valuable

5. Use the scale to describe your feelings when working **in a group** on math problems

1: Useless 2: Occasionally helpful 3:Productive 4: Valuable

6. Use the scale to describe your feelings when working **in a group** to learn new concepts in math class

1: Useless 2: Occasionally helpful 3:Productive 4: Valuable

7. How would you describe your mathematical ability?

____

____

____

8. Would you rather work on math problems alone or with your classmates? Explain

____

____

____

9. When working on math with your classmates, what do you think your responsibilities are? ____

____

____

10. When working on math with your classmates, what skills do you think you bring to the group?

____

____

____

11. Use the scale to describe how likely you are to use any of the groupwork skills (listed in
question 13) while working **with a partner** on math problems

1. Never 2. Rarely 3. Sometimes 4. Always

12. Use the scale to describe how likely you are to use any of the groupwork skills (listed in
question 13) while working **in a group** on math problems

1. Never 2. Rarely 3. Sometimes 4. Always

13. Circle the skill that you think is most important while working on math with others. Explain why you think that is the most important skill on the lines provided.

Sharing information

Everyone contributes

Describe accurately

Listen

Pay attention to what others need

No one is done until everyone is done

Explain by telling how

Everybody helps

Ask questions

Reflect on and make use of what's been said