The Relationship Between Assigning Competence and Students' Perceptions of

their Mathematical Abilities

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ABSTRACT

When status is not addressed in the classroom it can have a negative impact on students' perceptions of their ability. Teachers can limit the effects of status through a teaching technique called assigning competence. This action research study examined the relationship between assigning competence and students' perceptions of the mathematics ability in a 5th grade classroom. Data included a research journal, field notes, video recordings, student surveys, and student interviews. Analysis of the data revealed three findings. First, students saw making mistakes as a part of the learning process and, in order to be successful in math, they need to persevere through their mistakes. This was a related to assigning competence when students made mistakes, demonstrating that making mistakes was an intellectually important part of learning math. Second, students recognized they could ask questions when they were confused about the mathematics. This was related to assigning competence to students when they asked questions. Third, students noticed that the teacher was not the only resource in the room. This was related to assigning competence publically so that other students were positioned as competent in mathematics. Implications include status differences between students who migrate to our class for math from another classroom and our students in my original 4th and 5th grade classroom.

Keywords: assigning competence, status

ACKNOWLEDGEMENTS

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CHAPTER 1: INTRODUCTION

Through my studies of how to become a successful teacher I have learned the importance of trying new things. Progress cannot be made if you do not try. In this action research project I implemented a teaching technique, which was new to me, called assigning competence. Cohen and Lotan (1995) defined assigning competence as making "a public statement that specifically recognizes the intellectual contribution different students make to the groupwork task" (p. 86). In this study I use Cohen and Lotan's (1995) definition as well as the definition of competence provided by Grasalfi, Martin, Hand and Greeno (2009), which is explained as "A collection of skills or abilities that are attributed to individuals" (p. 50). As a result of assigning competence, I hoped to promote progress in students' perceptions of their own mathematical abilities. This research project took place in my first student teaching placement, so it has primed me for continued research throughout my career. Before becoming a teacher in my own classroom, I wanted to learn a technique that would help me be a better teacher and bring the best out in my students. Throughout my teaching career I plan to continue trying new teaching techniques and this project is my first attempt at doing so.

Purpose of the Study

The purpose of this study is to increase students' verbal participation in both whole class discussions and within their small groups. I hoped to do this by implementing the practice of assigning competence. This practice aims to limit the negative effects of status in the classroom by raising the status of students

who hold a low status. When students hold a low status they may not speak up in class because they do not feel as if their voice matters. In my future classroom I want all students to feel like their voices matter and that their ideas are important. In addition, without hearing the voices of all students in the classroom, it will be be very difficult for me to determine if students are learning.

I focused on the math classroom because of the findings by Cvencek, Meltzoff, and Greenwald (2011), which found that boys perceive their math ability as being greater than that of girls. Being a female teacher whose own educational background focused heavily on math, I wanted to find a way to help increase my female students' perceptions of their math ability. I hoped that assigning competence would not only help all students to voice their opinions, but also help the girls in my class perceive themselves as more competent in mathematics.

Problem and Significance

When students do not actively participate in class, it becomes difficult to determine whether they are learning the content or not. The reasons students don't participate may not be within their complete control; status is one of those reasons. I have found that students who hold high status in the classroom tend to dominate discussions and often don't allow other students a chance to share their thinking. These high status students sometimes give away the answer before low status students are given a chance to think about the problem. When students see their peers getting answers so quickly, they may not feel comfortable asking questions. When students feel comfortable asking questions,

I am able to determine how to modify my lessons so more students can access the content. For this study, I wanted to determine a way to limit the effects of status in my classroom and make sure my students felt comfortable enough to share their thinking and ask questions.

When status is addressed in the classroom, not only will I be able to better assess student understanding, students may be more willing to collaborate with their peers (Dembo & McAuliffe, 1987). My hope was that, through assigning competence, students would come to understand that each person has something intellectually important to contribute to the classroom and that students would come to see their peers as valuable resources for learning.

Research Questions

Based on the problem and purpose above, I decided to explore the following question:

What is the relationship between assigning competence and the ways in which students perceive themselves as competent in the mathematics classroom?

This is a broad question, so I decided to break this question into three sub-questions:

1) What do students think it means to "do mathematics"?

2) How do girls and boys differ in the self-perceptions of their math competence?

3) How do students respond to being assigned competence?

The first sub-question of "What do students think it means to "do mathematics"?" is important because students may not engage in lessons when they do not know the structure or topics we cover in the mathematics classroom. I wanted students to perceive mathematics as being useful to their everyday lives, to know that mathematics is more than memorization, and to see their peers as resources. I also wanted them to know that that it is okay to make mistakes along the way. With the way mathematics classes are typically taught and structured, I believe students can easily begin to think that mathematics is all about memorization and is not relevant outside of the classroom. I hoped that through the way I structured my mathematics lessons and by assigning competence, students would come to value mathematics, see their peers as an important part of their learning process and thus work more equitably and collaboratively with their peers.

The second sub-question of "How do girls and boys differ in the self-perceptions of their math competence?" is important because it is a common belief that boys are more confident in their mathematics abilities than girls (Cvencek, Meltzoff, and Greenwald, 2011). I wanted to determine if this was the common belief in my own classroom and, if it was, how I might shift that belief. I wanted to determine if assigning competence could help minimize this gap in perceptions between genders.

The final sub-question of "How do students respond to being assigned competence?" is important because when I thought about assigning competence I thought students would see it as bizarre. The verbal feedback students are

often given by their teachers is, "Good Job" or "Nicely done," which is not specific and does not give the students a sense of their intellectual contribution. I believe that if feedback is not specific, students do not know what to continue doing or what they need to change. I wanted students to perceive assigning competence as genuine and authentic. I also wanted students to broaden their understanding of what it meant to be "good" at math through their experiences of being assigned competence. This question was more directed toward my own understanding of the practice of assigning competence. I hoped this would help me to determine whether I need to continue working on the way in which I assign competence.

CHAPTER 2: LITERATURE REVIEW

Status and Participation

Teachers are always searching for additional ways to make learning more accessible to students in the classroom and ways to improve their teaching. Research has found that teachers can make learning more accessible by minimizing the effects of status in the classroom through assigning competence to students (Lotan, 2006; Blumfeld, Pintrich, Meece & Wessels, 1982; Cohen & Lotan, 1995; Horn, 2008). When teachers assign competence, they give specific feedback to students about the student's intellectual contributions to the learning community. Students can contribute to the learning community by asking questions, giving insight, or providing an explanation or answer. The purpose of assigning competence is to increase low-status students' participation and to show high-status students that they can benefit from listening to and understand the ideas of low-status students. In other words, assigning competence works to shift students' perceptions of themselves as competent and also can shift others' perceptions of that student's competence. Therefore, instead of there being a fixed understanding of being competent, there is a range of skills or attributes someone can have to be competent in math.

There are many different skills and attributes, which make somebody competent, and there are also many different kinds of status students can hold. Cohen (1994) outlines status as being broken into four different types: expert, academic, peer and societal. A student who holds high expert status means they commonly perceive themselves to be very competent in a specific content area.

Additionally, students who hold high academic status are often perceived as competent in a specific subject area by their peers. A student who holds high peer status is perceived by their peers as being athletically competent, attractive, and/or popular. A student who holds high societal status fits into the dominant race, ethnic group, or sex in that specific situation. In this action research I will examine students' academic and peer status.

Before teachers can assign competence to low-status students, they need to provide them with an opportunity to successfully participate. In order to support student participation, teachers must first create a positive learning environment that invites students to share (Featherstone, Cresop, Jilk, Oslund, Parks, & Wood, 2011; Mitman & Lash, 1988; Jansen, 2006). Teachers need to provide adequate wait time so that students have time to think and call on multiple students in the class, not just the students who come up with the answers quickly. This also means that teachers need to stop students from blurting out so that all students get an opportunity to think and answer. When teachers let students blurt out, students believe that the people who come up with the answers the quickest are the smartest or more competent. Students who perceive themselves as being less competent tend to give up and do not even try to answer questions because they know the high-status students will answer it first (Mitman & Lash, 1988). This limits their participation and their opportunities for active learning.

Encouraging Student Participation

There has been a considerable amount of research conducted focused on status and participation in general, but there has also been research on ways to encourage student participation. A couple of ways that teachers can encourage student participation is through recognizing the different types of feedback teachers can give and the way classrooms are structured.

Teacher Feedback

The type of feedback a teacher gives their students has a significant effect on students' perceptions of their abilities. Feedback can come in the form of praise or criticism. Both types of feedback are important, but they need to be given in a specific way so that they have a positive impact on students' future performance. Kamins and Dweck (1999) looked at how students' self-worth changed with the type of feedback they received. Perceived competence was synonymous with students' perceived self-worth. The researchers focused on person, outcome, and process feedback. Person feedback had to do with the teacher criticizing or praising the student as a person. For example, "I am very pleased with you." Outcome feedback had to do with the teacher criticizing or praising whether the student got the correct answer or not. Process feedback had to do with the teacher criticizing or praising the process the student went through to get their answer, disregarding whether the student got the correct answer or not. Kamins and Dweck found that students who received person or outcome feedback rated their self-worth lower than the students who received process feedback. The researchers concluded that it is important for teachers to

praise students on their learning process rather than critique them as a person or the correctness of their answers. One area that Kamins and Dweck did not mention was whether this feedback was given to students individually or publically. I believe that students do like to hear that they got the correct answer and it will have a more profound effect if the feedback is given publically.

Process feedback is most beneficial to students when it is specific. If students understand what they are doing well they can build confidence in that area, view that practice as beneficial, and are more likely to repeat it in the future (Kamins & Dweck, 1999). If the praise is vague a student may not know what was intellectually valued and may assume everything they were doing was valued even if it is not. For example, common feedback like, "Good job!" can be vague. This type of feedback is less likely to benefit student future learning because the student does not know what exactly they were doing that was valued and important related to the classroom community or the academic discipline (Kamins & Dweck, 1999). Therefore, teachers need to make sure that their feedback is very specific and help students gauge their future performance. Based on these findings, I decided to focus assigning competence on the students' processes and do it as specific as possible.

There are many features of effectively assigning competence. According to Cohen and Lotan (1995), effective assignment of competence has three critical features: 1) Teacher feedback must be made public, 2) Teacher feedback must be specific, referring to particular intellectual abilities/skills, and 3) The abilities/skills of the low status student must be made relevant to the group task.

Teacher feedback must be made public so that other students in the classroom, not just the student receiving the competence, will hear it. This ensures that other students will come to believe that student is competent as well. As a result, other students are more likely to seek help from that student on that specific skill. Teacher feedback must be specific because students need to know what it is that is valued so that they can continue with those actions. The ability or skill must be relevant to the group task so that students seek to include that person in the completion of the groupwork task. When group members hear that their peer is good at a particular skill, they will seek help from that student in that given area, effectively raising their status in the group. If the teacher feedback isn't specific the information is irrelevant and is not likely to have any affect on the groupwork (Cohen, 1994). The exception I make to this is that I believe it is important to also assign competence to students in private so they understand what they should continue doing in future work. Cohen and Lotan (1995) fail to talk about the benefits of assigning competence in private to students.

Assigning competence may not always be beneficial to student learning. Blumfeld, Pintrich, Meece, and Wessels (1982) note that it can be detrimental to student learning if teachers praise misguided effort or inadequate performance. Praising misguided effort or inadequate performance will confuse students on whether the teachers' feedback is genuine or not. In the future, students may not benefit from teacher's feedback because they may not perceive the feedback as genuine. In addition, students may not be able to determine which of their abilities are beneficial for their future performance. Sarcasm is often used to

inform students what they should be doing, but in an indirect way. Sarcasm focuses on what students are not doing, which does not support student future learning. Blumfeld, Pintrich, Meece, and Wessels (1982) fail to discuss English Language Learners (ELLs) and how they may find it difficult to interpret sarcasm and may take it literally, giving them mixed messages.

Instead of focusing on what students are not capable of, teachers should consider what students are contributing to the learning environment (Horn, 2008). In a study by Cohen and Lotan (1995) students were engaging in cooperative learning using classroom rules. Meanwhile teachers were moving around the classroom, giving feedback to students on their performance and participation through assigning competence. The participation of students who were labeled as low-status drastically increased. Teachers were said to be assigning competence to students once every ten minutes, which is not very often. Cohen and Lotan (1995) determined that it is not the number of times a teacher is assigning competence, but how the student is receiving it. In order for assigning competence to be effective, students must believe it and find it relevant to their current task.

Classroom Structures

Research has shown that, in order for students to voice their thinking, they must first feel like they are in a comfortable and safe place to do so (Jansen, 2006; Mitman & Lash, 1988). If students do not think they are in a safe enough place to share their thinking they may fear that their peers and teacher will judge them. Teachers can alleviate these feelings by incorporating a more child-

centered classroom by drawing on norms and roles and incorporating rich tasks that require critical thinking and collaboration, also known as groupworthy tasks. In the following paragraphs, I present research on the effects of both a child-centered classroom, created through the implementation of norms, roles, and groupworthy tasks.

Stipek, Feiler, Daniels & Milburn (1995) determined that it is beneficial to have a teacher-centered classroom when teaching kindergarten students to recognize letters and numbers. This was because this type of learning was based on memorization. By the time these students were in third grade the difference in achievement of students in a teacher-centered versus child-centered classroom disappeared. This finding suggests that there is no difference in student performance on achievement tests for students who are in a teacher-centered or student-centered classroom if the focus of the learning is on memorization. Stipek, Feiler, Daniels, and Milburn (1995) determined that students in a teacher-centered classroom rated "their abilities significantly lower, had lower expectations for success on academic tasks, showed more dependency on adults for permission and approval, evidenced less pride in their accomplishments, and claimed to worry more about school" (p.209). However, when teachers had a student-centered classroom, students rated their abilities as being higher, had higher expectations for success on academic tasks, showed more independence from adult support, and were more proud about their accomplishments in school. Since my research question focuses on improving

students' perceptions of their abilities, I ensured that I created a student-centered classroom that did not focus on memorization.

A child-centered classroom has limited, but purposeful teacher instruction, more student discussions, and groupwork where students can cultivate their own learning. When first implementing a child-centered classroom, students need to be taught how to have discussions. Teachers may play more of a facilitating role and, as students become more familiar with the structure of discussions, the teacher can walk around more and ask thought provoking questions to further discussions (Hufferd-Ackles, Fuson, & Sherin, 2004). Students can take more responsibility for their own learning because a child-centered classroom promotes students to view their abilities as high, to have higher expectations for themselves, to be more independent of the teacher, to have more pride in their accomplishments, and to worry less about school and more about real-world problems (Stipek, Feiler, Daniels & Milburn, 1995).

The high-status students who may feel more competent in the discussion-based classroom may often dominate discussions and not give low status students a chance to speak up. By setting classroom expectations and norms teachers can make students aware of their contributions and allow room for other students to share, which can create a more positive learning environment and allow all students to engage in lessons (Featherstone, Crespo, Jilk, Oslund, Parks, & Wood, 2011). One way teachers can ensure that students are staying on task and everyone is contributing to the classroom learning, is to set classroom norms and rules. This process can be started by having a classroom

discussion on what is important for students to have in their classroom. For example, one student may say that it is important that people do not laugh at their questions. Teachers may take this information and develop a list of rules that they can post in the classroom and refer back to throughout the year. The example above could fall under the rule of being respectful of different perspectives. It is important for these rules to be written in a positive form, rather than the negative form of what students cannot do. Two common classroom norms are to listen to your peers and to make sure everyone's voice gets heard. These two norms work towards cooperative learning because high-status students must recognize that they need to regulate their input so they can learn from other students in the classroom. By establishing classroom norms and rules, students are more likely to participate in classroom learning and have more chances to feel competent.

Once norms and rules are established, students can begin to learn how to interact in groups. Research has shown that, within groupwork settings, students who hold high-status in the class tended to dominate group interactions, were more influential, and more likely to be perceived as leaders (Dembo & McAuliffe, 1987). Groupwork is beneficial for student learning, but it is important for the work to be groupworthy. In order for a task to be groupworthy, it must require multiple people to complete it successfully. No single group member should be able to do the work on their own in the given time constraints. When tasks are made groupworthy, students will realize that they each have strengths that can help them solve the problem together (Featherstone, H., Crespo, S., Jilk, L.,

Oslund, J., Parks, A., & Wood, M., 2011). In my research I am hoping students will begin to see their peers as resources, which will not be realistic if the tasks are not groupworthy, where they need their peers in order to complete the task.

Another factor that needs to be taken into consideration when trying to get students to work in groups is the beliefs of students. Jansen (2006) evaluated the differences between the two types of students who are found in discussion-based classes, students with constraining beliefs [students who rarely talk in class discussions] and students with beliefs that support participation [students who are main contributors to class discussion]. Researchers found that "students with constraining beliefs were more likely to participate to meet the goals of helping their classmates or behaving appropriately, whereas students with beliefs supporting participation were more likely to participate to demonstrate their competence and complete their work" (p. 409). This emphasizes that even though teachers can structure their classroom to include discussions, students have different motivations for participation. Teachers cannot assume that by simply giving students feedback and structuring their classroom in a more student-centered way that there will be a more equitable classroom.

Competence

When trying to limit the effects of status and trying to encourage students to participate in class, competence cannot be overlooked. Wanlass (2000) explains that the way a community defines competence may limit the number of students who can perceive themselves as being competent. Often times when students think about competence they generalize for the whole subject, but there

are many aspects and skills necessary to be competent in each subject. Using the example, "Suzy is really good at mathematics", a teacher can be more specific about how she is good at specific skills within the domain of mathematics. The definition of competence needs to be at the core of teachers' efforts if all students in the classroom want to be perceived and perceive each other as competent (Lotan, 2006). One way of doing this is by recognizing the key elements of the subject area. In mathematics, this means breaking it down into areas like algebraic thinking, measurement and data, geometry, or the ability to reason abstractly. Each person determines this definition, but this definition must go beyond memorization or the ability to quickly find an answer.

One researcher, Harter (1982) notes four domains of competence: cognitive, social, physical, and general self-worth. Harter believes that these four domains together are what affect students' overall competence. Cognitive competence involves academic achievement and how they feel about their classroom performance. Social competence involves whether a students has a lot of friends, whether they are easy to like, and are seen as an important member of one's class. Physical competence involves how well a student does in sports, their ability to learn new outdoor games, and whether they prefer playing sports rather than watching other people play. General self-worth was defined as whether a student saw themselves as being sure of oneself, being happy with the way one is, feeling good about the way one acts, and thinking that one is a good person. Students do make distinctions between each of the domains of competence and perceived competence is determined by the domain on which

the student puts the most emphasis on which will be different for each student (Harter, 1982).

Building on Harter's (1982) belief that perceived competence will be different for each student, Blumenfeld, Pintrich, Meech and Wessels (1982) believe it changes with age. Young children (six years and under) believe that students who try harder are smarter. Seven and eight-year-olds believe that equal effort should result in equal outcomes, regardless of their abilities. Nine through eleven-year-olds believe that the level of effort they put in determines ability. Eleven year olds and older, typically believe that effort, ability and outcome are separate. Therefore, younger children tend to believe in an incremental theory of ability. The incremental theory of ability notes that anyone can become smarter and they will over time (Dweck, 1999). As children get older they believe in a more fixed theory of ability. Contrary to the incremental theory of ability, the fixed theory of ability states that students will only get smarter if they succeed. Blumenfeld, Pintrich, Meech, and Wessels (1982) did not go into detail about how assigning competence to students would affect their perceptions of their math abilities.

I am interested in the relationship between assigning competence and students' perceptions of their math ability. Researchers have noticed how students' perceptions of math change with age and with what type of competency they put emphasis on. They have noticed key differences in perceptions of boys and girls ability, but I was interested in whether these findings would transfer to my classroom. Lastly, researchers have looked at how their feedback has

affected students' performance, but I wanted to look at how assigning

competence would affect students' perceptions of their ability of math, not

necessarily their performance.

CHAPTER 3: METHODS

Participants and Setting

The setting for my action research was in a public elementary school named George Washington Elementary School[1] that serve kindergarten through fifth-grade students. The school is located in an urban community in the Pacific Northwest of the United States. At the time of this study, the school enrolled approximately 300 students each year. George Washington Elementary School was the only alternative elementary school in the district. The teaching philosophy focused on developmentally appropriate instruction, integrated curriculum, family involvement, and development based on key learning dimensions. For example, students were free to work through many assignments at their own rate. They were given opportunities to share and build on their prior experiences as well as hands on experiences to explore topics on their own or through guided instruction. This school was unique because families were strongly encouraged to participate in the classroom so that a healthy relationship could be maintained between the teacher, families, and students. The school focused on collaborative learning through implementation of groupwork into their daily activities and open communication between teachers, families and students. It was typical for family members to be seen in the classroom and students were often encouraged to work together in groups. Sometimes a parent volunteer, my mentor teacher, or myself facilitated these groups. The teaching philosophy, designed by the teachers and parents, held that students should be

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[1] All names are pseudonyms.

active participants in their education, rather than going through scripted curriculums. With this philosophy, teachers were given freedom to design their own curriculum.

The school consisted of twelve multi-aged classrooms. For math, students migrated to single-grade classrooms to allow for more focused instruction that aligned with the grade level expectations of the common core state standards. The math classroom that was the focus of this research project was a fifth-grade classroom. Since there were so many fifth-grade students in the school, two classrooms of fifth-grade mathematics were formed. However, I only focused on the classroom in which I taught. The students in that mathematics class consisted of the fifth-graders from our original classroom and six students from another fourth- and fifth-grade multi-aged classroom. There were twenty-four students (average age =10 years and 7 months, 6 boys and 18 girls) total who participated in this study. Based on the 2012-2013 school year data, the school is about 53% male and 47% female. 80% of the students are Caucasian, 9% Hispanic, 5% multi-racial, 4% Asian or Pacific Islander, 1% American Indian or Alaskan Native, and 1% African American. 28% of students receive free or reduced meals. 17% of the students are in the special education program.

In the previous school year, I was a practicum student in this same classroom; therefore, I already had experience with the fifth-graders who were in this classroom the previous year as fourth-graders. In my practicum experience, the mathematics classroom I was in had fifth-grade students only, so even

though I had prior experiences with these students I was not familiar with their math ability since they were with another teacher.

The school does not label students as talented and gifted (TAG), but they occasionally allow advanced students to participate in the math class that is above their grade level. One struggle I experienced through my research was that there was one advanced student in the class who was previously in the class as a fourth grader. In order to accommodate for this student I provided her with extension assignments. However, she was already familiar with the material we had covered and, as a result, she often finished early during class time. There were two students in the class who were on individualized education plans (IEP). These students participated during the teacher instruction at the beginning of the class time, but were then pulled out to work on assignments with a specialist.

Action: Assigning Competence

Throughout this research I tried to structure each lesson to provide multiple opportunities for students voices to be heard. The typical structure was to have problem strings, groupwork, individual check-ins, and daily progress worksheets (See Appendix B). Problem strings are one form of number talk where students work on developing accuracy, efficiency and flexibility when computing problems (Parrish, 2010). A problem string is a series of problems, where the first problem is most simple and the following problems build off of the first one and become increasingly more difficult. While working through problem strings, I encourage students to share all of their answers, so we can talk through each of them to address misconceptions. One issue with problem strings is that

many students do not want to share their answers because they do not want to be wrong in front of their peers. I want to teach students that mistakes are okay and it is a process everyone must go through to learn. One example of assigning competence that I thought would be very beneficial was to give students positive feedback in problem strings on areas that they did very well. If a student did not get the right answer, I would give them positive feedback on the process of getting to their answer and not mention whether they were right or wrong. When a student did have a wrong answer another student would offer to explain how they did that portion differently. The student would then realize the area where their misunderstanding was and revised their answer. Problem strings were very beneficial because peers could help that student recognize the mistake so they could revise their thinking. I did not provide students with sentence frames, but the feedback students gave each other was very positive.

Despite how beneficial problem strings are, not all students are going to participate in them every time we do one. Therefore, I needed another way to determine if the students understood the material. Another way I do this is through having students work in groups on one activity. I figured that students who may not feel comfortable sharing in whole group, may feel comfortable enough to share with two or three of their peers. While students are working in groups I would circulate the room and focus on going to the students who I did not hear share during the problem string. By doing this, I got to increase the number of students I heard from each day, but occasionally I still would not get to every student.

In my last attempt to hear from students I would have them do daily progress worksheets. On these daily progress worksheets I had students put the learning targets into their own words, rate their understanding of the learning target prior to the lesson and afterwards. Also, on these worksheets was a place for students to ask any lingering questions after the lesson. Occasionally we would have a problem associated to the learning target that day that students would record in their mathematics notebooks. Students kept their mathematics notebooks in their desks, so if I needed to I could look through them. I would look at students' notebooks if I did not hear from them throughout the day or if I still had worries that they did not understand after talking with them individually.

Despite how many attempts I made to get every student's voice heard, I still was not getting an accurate read on whether students understood the concepts. I was unsure why I was having such a difficult time, but I knew it was vital for me to do this in order to become a successful teacher. After taking courses in my first year of my master's degree I learned about a teaching technique called assigning competence. Assigning competence seemed desirable to me because one of the purposes of it is to give positive feedback to students so they know what they are doing well. By assigning competence in front of students' peers, everyone could come to know that each person has unique attributes to bring to the group. Overall, this could make students more confident in their abilities, so they will share their thinking with their peers and work collaboratively. Also, when students are confident in their abilities, they are more likely to participate in problem strings and small group discussions.

Data Collection

I was placed at George Washington Elementary School for a ten-week student teaching placement while in my Master in Teaching program. I began the ten-week placement co-teaching with my mentor teacher. During this time, I began practicing assigning competence to students when I was working with small groups or independently with students. There was a 3-week time frame during my placement where I was solely responsible for planning, teaching, and assessment. I conducted my data collection during this 3-week time frame. To collect data for my study, I kept a research journal and field notes, I video recorded and transcribed my lessons, and I conducted two student surveys and interviewed six students.

Research Journal and Field Notes

I used a research journal to analyze various situations as they came up throughout my lessons. I used split page notes to write observations during the class on the left side, and then left the other side open for analysis at the end of the day. The split page notes allowed me to connect my observations and analyses in one location. I did not take notes in my research journal during my mini-lessons, but once students started working on their group work I walked around and took observation notes. One example of my observation notes were noting what roles students were taking in the group work. I kept note of which students were taking leadership roles versus being quiet. At the end of the day, I took my observation notes and compared them to the past research findings to determine if they were consistent or not. I wrote the connections in the analysis

portion of my research journal. My research journal was intended to help me better understand my lessons throughout the 3-week action research portion of the study.

In my field notes I reflected on my lessons at the end of each day to determined ways that I could improve my instruction to better accommodate students and how I could better work on assiging competence. These field notes were written outside of class time at the end of the school day or when I got home from school. The notes reflected how I felt students were responding after I assigned them competence and they also included how I felt when I was assigning competence. I took notes on which students needed a status shift and ways I should go about doing it. The field notes were intended to help me keep track of students who needed to be assigned competence and how they responded to it. My field notes were more of a personal reflection of what I was noticing in the classroom in relation to my instruction. I then used those reflections to determine the next steps for action.

Video Recording

I planned all of the lessons that I taught based on the Bridges Mathematics Curriculum (2014), incorporating groupwork when appropriate and building on students' prior knowledge. I video recorded each of my lessons during my solo teaching, for a total of 15 lessons that lasted over 15 hours. I video recorded the entire allotted time for mathematics, which included whole group instruction, small group instruction, and one-on-one work with students. I assigned competence during each of these instruction times and wanted to

capture each of them. I wanted to catch interactions that occurred between students and how students reacted after I left the group. The video camera was placed in the back of the classroom or at the edge of the students' table group. The wide view of the classroom allowed me to see my own interactions with the students while I was teaching and assigning students competence during whole group instruction. When the lessons moved to groupwork or independent work I moved the camera to the edge of the students table group. The closer table group view allowed me to see how students reacted to being assigned competence. The video recordings were intended to help me view what I could not see on my own. These recordings helped build on what I may have been missing from my research journal and field notes. For example, the video recordings allowed me to view how students interacted with each other after I assigned competence to one student in the group. They also helped me solidify how and who I was assigning competence to so that when I was analyzing my data I would more accurately determine this information.

Student Surveys

At the beginning of my ten-week placement, I gave students two surveys that helped me understand their perceptions of the nature of mathematics and the status in the classroom. The survey that looked at the perceptions of the nature of mathematics, I refer to as the academic survey. The survey that looked at the status of students in the class is referred to as the status survey. The status survey asked students to circle the names of their peers who they thought contributed positively to the lessons; this portion of the survey was how I

measured academic status. In this survey I also had students circle their closest friends in the class; this how I measured social status. While I recognize that students might not perceive their close friends to be of high social status, I used this information to determine if there was a relationship between students who are perceived as contributing positively and those who are perceived as friends. I conducted both of these surveys during class time to ensure that all of the students completed the survey. The surveys were intended to help me understand how students viewed themselves and other students in the classroom (see Appendix B for a copy of the academic survey).

Student Interviews

After the student surveys were collected, I conducted interviews with six students to ask them questions that were not answered by the two surveys. I used these interviews to ask students about the type of feedback I can give them to help support their learning. Further, I asked them how the changes they offered would help change their perceptions of their mathematics abilities. I asked them about how they would react if I were to say something positive about another students' ability (assign competence), and if their perceptions of their mathematics ability would change. I avoided using the terminology *assigning competence* because students may misunderstand the word *assigning* and think that they really do not have that competence.

I conducted the interviews face-to-face with students at a table on the side of the classroom. The table was far enough away that students were not heard while the other students were at their table groups working. If students did not

feel comfortable being interviewed at the side of the classroom, and if there were parent volunteers, I conducted the interviews right outside the classroom door at a small table. These individual interviews allowed me to ask students more complex questions about their perceived competence and beliefs about math. See Appendix A for sample questions for the interviews.

<div align="center">

Data Analysis

</div>

In order to explore my research question, which investigated the relationship between assigning competence and students' perceptions of themselves in mathematics, I analyzed my research journal, video recordings of my lessons, student surveys, and student interviews.

Research Journal and Field Notes

I coded the research journal and field notes by looking for key themes and concepts that came up in my reflections (Mertens, 2010). I highlighted and flagged the themes and concepts with matching colors. I then analyzed the similarities and differences that I was finding within these key themes and concepts. I made a concept map that showed my findings. For example, one of the themes was questioning. Whenever I saw notes related to questioning I would write the date, page number in the research journal or field notes and key information that went along with that note. Then I could transfer these notes to a larger data display for each of the research questions.

Video Recordings

I uploaded the video recordings onto my computer and created a content log. In this content log I created a summary of the lesson that was taking place in

the video and a list of time stamps throughout the video that have potentially important interactions in them. I transcribed the potentially important interactions that they captured. I then went back to my data display and added time stamps of video recordings that corresponded to the themes and concepts found in my research journal and field notes. The content log would be used as a reference for the data display and as an index for my video recordings.

Student Surveys

I analyzed student surveys by putting them into an excel spreadsheet. I determined how many students voted in each category of strongly agree to strongly disagree or never to always (See Appendix C for a copy of the survey). Looking back at the research questions, I decided only a few of the questions really applied to my project. I looked specifically at the following survey questions:

- I really enjoy mathematics class when I don't have to work hard.
- I really enjoy mathematics when the whole class learns together.
- When I try hard in mathematics it is because I want my classmates to think I'm smart.
- Other subjects are more interesting than mathematics.
- In mathematics class, how often do you try to help your classmates solve a problem?
- In mathematics class, how often do you try to get more answers right than your classmates?
- It's okay to make mistakes in work.

- It is good to make mistakes at the board.

The question I focused on more heavily was the last question where students rated different mathematics class characteristics in the order of importance. This question helped me answer my first secondary research question of what students thought about what it means to "do mathematics".

For the status survey I counted how many votes each student received in each of the categories (peer and academic status). Then I ranked the students under each of the categories individually to determine each student's social status and academic status. Then I arbitrarily assigned students a number and placed these rankings on two separate graphs (shown below).

Social Status
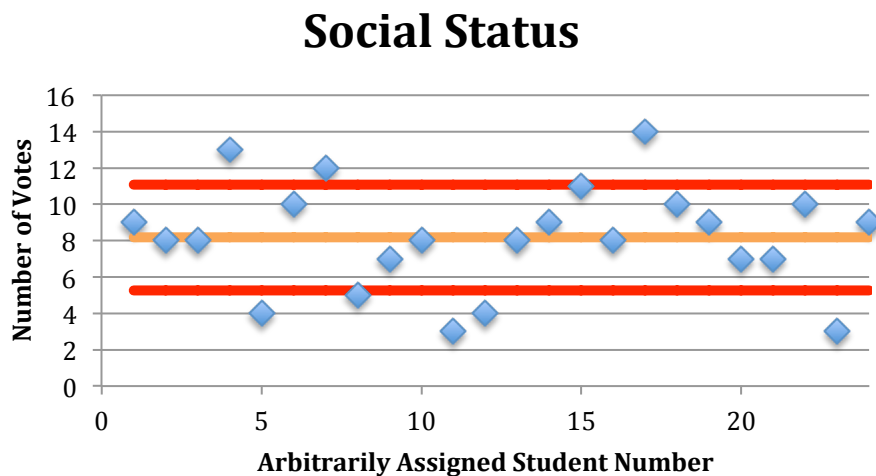
Academic Status
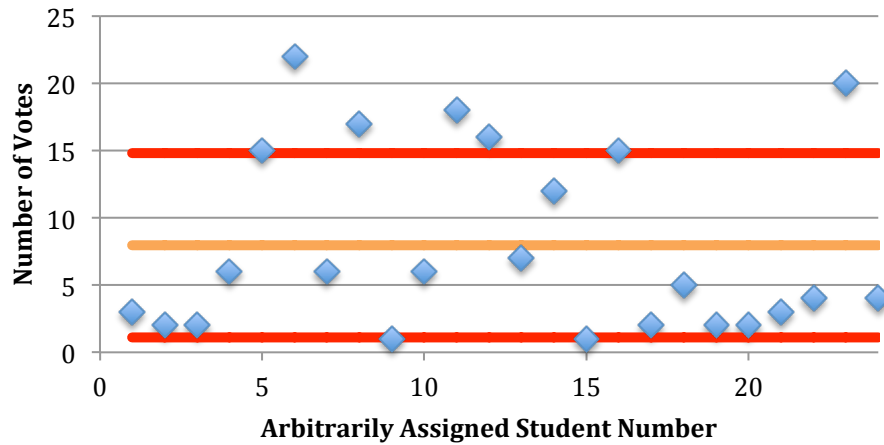
On these graphs, the orange line is the average number of votes students received from their peers and the red lines show one standard deviation away from that average. Throughout my research I wanted to focus on assigning competence to the low status students to work on minimizing the effects of status in my classroom. Therefore, the students I focused on assigning competence to mostly were the students who fell below one standard deviation in the number of votes received in both academic and social status. When I was analyzing the status surveys I kept in mind that this was a perceived scale, so it did not necessarily mean that students were or were not competent or held that level of status.

Student Interviews

I analyzed student interviews by first listening through each of the interview recordings. I recorded time stamps in a content log and gave a short explanation of the importance of that portion of the interview. Then I looked at the themes that occurred in my research journal and field notes and determined

whether portions of the interviews overlapped with those themes. When I found sections that overlapped I then transcribed them. The student interviews helped me to address all three of the sub-research questions. From the transcriptions I took quotes about how students perceive math.

Study Limitations

In order increase the credibility of my study, I attempted to triangulate my findings by using multiple sources for collecting data. I wanted to ensure that my findings were actually a result of the data I collected. When all of my research was completed, I had colleagues in my teacher preparatory program peer review my research and findings. This also increased the credibility of my study. This study was conducted over a short period of time, which may decrease the credibility. The findings may be more credible if the study was done over a longer period of time.

This study was helpful in determining how students' self-perceptions are affected by teachers' assigning them competence. In order to increase the transferability of my study, I attempted to provide a rich, thick description of the setting and participants that take place in this research to help others become familiar with the study.

My research is meant to examine how the teaching practice of assigning competence can help students perceive themselves as more competent in the math classroom. I did not intend for my research to be a solution to students' low self-perceptions. My objective was to practice a teaching technique that

researchers have concluded beneficial for students and determine if it is a technique I want to continue in my own teaching.

CHAPTER 4: FINDINGS AND IMPLICATIONS

Findings

This action research project examined the relationship between assigning competence and students' perceptions of their math abilities. I broke this over-arching question into three sub-questions:

1) What do students think it means to "do mathematics"?

2) How do girls and boys differ in the self-perceptions of their math competence?

3) How do students respond to being assigned competence?

In order to analyze these questions, I collected data from a variety of sources. I kept a research journal and field notes, collected two surveys from students, video recorded lessons, and conducted interviews. Through analyzing my data, I uncovered three themes. First, I found that students do not view mistakes negatively; rather, they viewed mistakes as a matter of persevering and working through them. Second, I found that students valued questioning and saw it as a strategy to help them and their peers be successful in the math classroom. Third, I found that students do view their peers as resources.

Mistakes as Learning Opportunities

Through my analysis of the academic survey, my field notes, student interviews, and the video recordings, I found my students making mistakes. Instead of my students becoming discouraged by making mistakes they worked on identifying their mistakes so they could persevere through the problem. Students believed that you didn't have to always get the right answer in order to

be smart at math. They believed that it was possible to make mistakes and still be considered smart, as long as they were capable of recognizing their mistakes, persevering, and revising their thinking.

In the survey I looked at students responses to the two statements: It's okay to make mistakes in work and it is good to make mistakes at the board. When analyzing students' responses to "It's okay to make mistakes in work", 100% of students strongly agreed or agreed. When analyzing students' responses to "It is good to make mistakes at the board", 80% of students strongly agreed or agreed. From these answers I have determined that students do value making mistakes and are not afraid to make mistakes in front of their peers.

I confirmed my findings in the survey through my student interviews. Below is a transcription of one student's response that included their insight on mistakes:

Ms. Elofson: What makes someone successful in math?

Student: Failing. You learn from your mistakes and sooner or later you will figure out the answers. So you may not get it right at first, then you do it again and you still don't get it right, then you do it again and you still don't get it right, but eventually you will get it right. That's learning.

This student noticed that before you can succeed you must fail and that success comes from persevering. Eventually you will come to the answer, but it may take a few trial and errors.

One student, Stephanie was working on sharing her misunderstandings. In my video recordings I noticed that at the beginning of my data collection she

was hesitating to share her answers. Then she gradually began sharing her answers, even if they were different from her peers. There were a couple of times when she would come up to the board and explain her thinking. Instead of verbally explaining her thinking, she would work through the problem step-by-step. She would occasionally stop and look at her writing and eventually she would say, "Oh wait! I notice what I did!" I assigned competence to students when they were recognizing their misunderstandings and would say, "Stephanie recognized where she had a misunderstanding and revised her thinking. Revising your thinking is an important skill for mathematicians." By assigning competence in this situation I publicly identified the skill Stephanie demonstrated, which encouraged other students to work on identifying their misunderstanding and revising their thinking.

In my field notes I reflected on one student, Sarah who was continuously getting wrong answers. At first this really concerned me because I wanted her to get the right answers. I could see her getting upset when other people were getting the correct answer and she still did not understand. One aspect of Sarah that I appreciated was that she was not afraid to say she made a mistake and wanted to talk through it. She noticed that if we did not talk about her thinking process then she was not going to be able to identify her misunderstanding. Sarah was one of only a few students who did this, but as she continued to do it, and I continued to assign competence to her thinking, other students began to take risks and do the same.

Questions are Important for Learning

Through my analysis of the my field notes, student interviews, and the video recordings, I found that students were asking questions as a technique to help them work through their misunderstandings. My students recognized that mistakes were a sign of learning, but then they had to determine how they were going to persevere through their misunderstandings. Asking questions was my students' technique for persevering.

Continuing to look at my reflections on Sarah's experience throughout the implementation of this study, I noticed she was asking a lot of questions. As Sarah began asking questions, so did her peers. Across the study period, students began to ask me less questions and instead would turn to their peers and ask them questions. It is important to note that Sarah held very high social status in the classroom, which I think led her to have such a large impact on her peers. After looking through my video recordings I realized that I had been assigning competence to Sarah when she would ask questions by saying, "That is a really good question, Sarah! It makes me think about [refer back to a lesson that had to do with her question]" and occasionally I would build on that and say, "Questioning is a really good skill to help us understand concepts." The purpose of my adding on that second part was to show students that they too should work on asking questions.

I confirmed this theme through the student interviews. Below is a transcription of an interview with one of my low-academic status students:

Interviewer: What do you think it means to do math?

Student: Focus and I think asking a lot of questions because if you don't

know something your not going to know how to do it. So um, like, um,

yeah and just making sure you know everything that people have taught

you.

In this transcription the student identified asking questions as a way of helping a

student know what to do. At the end of her response she said, "just making sure

you know everything that people have taught you" which I first saw as being an

odd response, but then after looking at my video recordings I realized that I often

referred back to previous lessons and now my students are working on doing the

same in their thinking.

Peers as Resources

Through my analysis of my field notes, student interviews, and the video

recordings I found that students were no longer seeing the teacher as the main

resource in the classroom. Over time, my students were coming to me less with

their questions and instead turning to their peers. Students were recognizing that

their peers had skills that they may not have developed yet and by asking them

questions they could use their peers' skills to help them learn.

In my field notes I wrote about how frequently my students were coming to

me with questions. At first I thought the issue was that I was not explaining the

concepts well enough, but then I realized the only instruction I was giving them

about the specific multiplication strategies was by providing them with a definition

and one example. After this instruction, we worked on applying the strategies

through problem strings and groupwork. Throughout my three weeks of solo-

teaching my structure of lessons did not change, but the rate at which students were coming to me with questions did change. Once students became more familiar with the structure of the lessons they came to me less with their questions. I also think this was a result of me assigning competence to those in their groups.

I confirmed this finding through my video recordings. I had recordings of me assigning competence to one student in a group. As I walked up to a group I would assign competence to a student based on an observation I made. Then I would leave the area, while my video recording was still focused on that group. I noticed students who I was assigning competence to smiling, but then I noticed the other group members engaging more with that student who was assigned competence by asking them questions.

Another way I confirmed this finding was through my student interviews. Below is a transcription of one student's idea about using their peers as resources:

Ms. Elofson: When you get feedback would you rather it be independently or while working in your group?

Student: I think it is more important to do it in groups because a lot of times if you have a strategy and you share it with other people, they can get ideas from your strategy or vice versa.

This student recognized the importance of working in groups and being able to share strategies with one another. In this question I was intending it to mean

getting feedback from the teacher, but it seems as if this student was figuring the feedback could also be coming from their peers.

These themes were very helpful for me to recognize in my teaching practice, but how do these themes relate to my original research questions:

1) What do students think it means to "do mathematics"?

2) How do girls and boys differ in the self-perceptions of their math competence?

3) How do students respond to being assigned competence?

These themes seem to directly relate to my first sub-question of "what do students think it means to 'do mathematics'?" Students think it is important to make mistakes, perseveres through asking questions, and use their peers as resources. The connections to my last two sub-questions less direct.

I did not recognize any differences in self-perceptions between boys and girls, but I believe this may have been a result of the wide difference in number of girls and boys in the classroom in which my research took place. The typical stereotypes may not have been evident in my classroom because the number of girls drastically outweighed the number of boys. I also failed to make sure students wrote their names on their surveys, which would have been one of my main sources of data for analyzing this question. In my future implementation of this research I will make sure students put their names on all data sources.

In terms of my last question, I looked to my video recordings and student interviews. In my video recordings I was able to see my students perk up after being assigned competence and put a smile on their face so I thought students

enjoyed me assigning competence to them. I did not feel like I could accurately make a claim about this finding without getting specific feedback from students through their interviews. Below is a transcription of a student explaining to me why they thought assigning competence was helpful:

Ms. Elofson: Do you think it matters if I tell you what exactly you did well?

Student: Yeah

Ms. Elofson: Why?

Student: Because if your just like, "Good job," I may not know what I did a good job of. You could tell me specific details of what I did do well or like how I did on the problem. If you just said, "Good job" I wouldn't be as appreciative, or not appreciative, like as helpful or I don't know the word for it. But telling me what specific part of it I did good would be helpful."

From this transcription I can tell that students did value the specific feedback I was giving them by assigning competence.

Implications

In my research I was trying to focus on assigning competence to the low status students so that I could raise their overall status in the class. Ultimately, I ended up assigning competence to all students rather than the small selective group I was intending to when I started this research. This made it difficult for me to determine whether my students' status was changing as a result of me assigning competence. However, I did find that students tended to use their peers as resources and they saw mistakes as important learning opportunities.

I also noticed the status differences for those students who migrate to our class from another classroom. Those students who only come to our classroom for math instruction typically held a very low social status. I anticipate this was because this group of students was not with the whole class for the entire day and were not given an opportunity to create that relationship because we were so early in the school year when the status survey was administered. I continue to wonder if this finding would still be present in the classroom if the status survey were presented towards the end of the school year.

Future Research

Prior to implementing the action research project, I had planned on doing pre and post surveys to analyze how perceptions changed before I took over teaching and after I completed my three-week solo teaching. Unfortunately I got caught up in other obligations was not able to administer pre-assessments. I ended up administering the surveys halfway into my solo teaching, so they became mid-way assessments. As a result of the assessment being administered halfway into my solo teaching, I found it difficult to use it as a valid data source.

I also think my other survey could have been focused more on my research. The survey I used was modified from a survey created by Jo Boaler. I used the survey out of convenience. I think the survey may not have been developmentally appropriate for my students. When I administered the survey I did not go through the questions and explain them to students, so if I am to use these surveys again I will need to do this or change the wording to make it more

developmentally appropriate for whichever grade I will be doing this research in. In my student status survey I wish I had talked with students about what it means to share the most important ideas and what it means to be a best friend. I had one student who circled everyone as being their best friend and sharing the most important ideas. My idea behind separating who their best friends were and who shares the most important ideas was to eliminate students from noting only their best friends as sharing the most important ideas.

I noticed that I had a difficult time exploring the sub-question of how do girls and boys differ in the self-perceptions of their math competence? I think this may have been because the classroom in which I conducted this study had six boys and eighteen girls; that is three times as many girls than boys. Any boy versus girl differences may be hindered because there were so many more girls than boys in the class. Since the girl to boy ratio was so drastic in the classroom I think it was difficult to determine if the findings from Jacobs, Lanza, Osgood, Eccles, & Wigfield (2002), that boys perceive their abilities in math higher than girls' perceptions of their abilities in math, transferred over to my classroom. I believe that typical behaviors boys may exhibit in a classroom could have been diminished because the girls in the class greatly numbered them. I hope to be able to look into this difference in a future classroom where there are just as many boys as there are girls.

During this study, I found it challenging to assign competence to students as often as I wanted to. Too often, my feedback was non-specific and fell into patterns of "Good job" or "Nice thinking." For future research I think it will be

important for me to develop sentence starters for myself so I can properly assign competence. I could easily have these sentence starters written on my research journal as a reminder as I am going through lessons. By having sentence starters I think I can minimize my unspecific feedback and catch situations where students should be getting specific feedback on their intellectual contributions.

Overall, I do hope to continue working on assigning competence to students. I think it is important to give students positive, specific feedback on how they are doing. I want students to come to value working with others and hearing what their peers have to contribute. I want to limit the effects of status in my classroom and create a supportive classroom environment that supports student learning, not only in the math classroom, but all subject areas.

Closing Comments

The purpose of this study was to investigate the relationship between assigning competence and students' perceptions of their mathematics ability. Through this action research project, I was hoping to better understand how my feedback could support students' perceptions of their mathematics ability. I have always known it is important to give students feedback on their performance, but after this research I have noticed the importance of giving specific, positive feedback to my students through assigning competence. I look forward to further developing my teaching practice around assigning competence and student status. With that being said, I would like to leave you with a quote from one of my interviews about the benefits of assigning competence:

"If you only focus on the negative and not the positive then students begin to think they are bad at math. And they, like, start to shift down and not do good in math even when they were doing good in math before."

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Appendix A

Interview Outline

- Explain to students what I am doing:

  o Trying to collect feedback from students about my teaching

  o Get an idea of what students thoughts were about math over my time in
    the class

- Ask students some questions

  o What does it mean to do math?

  o What makes someone successful at math?

  o What can teachers do to help students be successful?

- Explain my research

  o One thing I thought teachers could do to help students be more successful
    was to give specific feedback to students.

  o Ask students:

    ▪ Do you think specific feedback is any more helpful than a teacher
      telling you, "Good Job"?

    ▪ Do you prefer feedback to be given to you independently, one-on-
      one with a teacher, or publicly in front of your peers?

    ▪ Do you have any other feedback you would like to give me or
      anything else I should note about math class?

Appendix B

Daily Progress Worksheet

Name_____ Date_____

Daily Progress Worksheet

Today's Central Focus:_____

Word of the day:_____

Today's learning target:_____

_____

BOARDING PASS:
Self-assessment: Circle your level of understanding of the learning target.

4   I know this so well, I could teach it all day long

3   I can do this on my own without any help

2   I can do this with a little help

1   I can't do this yet

Resources available today: Circle all that apply

Peers   Journal Notes   Workbook   Calculators   Manipulatives

Other_____

Notes:

EXIT TICKET:

Today I learned:

One thing I'm still wondering about:

Self-assessment: Circle your level of understanding of the learning target.

4   I know this so well, I could teach it all day long

3   I can do this on my own without any help

2   I can do this with a little help

1   I can't do this yet

A note to the teacher:

Appendix C

Academic Survey

Mathematics Class: _____Mathematics Teacher: _____ Your Initials: _____

1. Describe an idea you thought was really <u>interesting</u> in your algebra or support class:

2a. Describe a <u>really good mathematics lesson</u> you have had in this class or any other mathematics class.

b. What made that lesson good?

3a. Describe a <u>really bad mathematics lesson</u> you have had in this mathematics class or any other

b. What made that lesson bad?

4. What helps you to learn mathematics?

5. How much do you agree with these statements about mathematics: (check one box)

Strongly Agree	Agree	Disagree	Strongly Disagree

Mathematics will be really important in my future career
Other subjects are more interesting than mathematics
Mathematics is really useful in life outside school
Mathematics is a lot of procedures that have to be memorized

6. Which of these statements do you agree with MORE: (circle one)

School mathematics is based on things that happen in the world
OR
School mathematics is very different from things that happen in real life

7. Which of these statements do you agree with MORE: (circle one)

Success in mathematics is mainly about memorization
OR
Success in mathematics is mainly about thinking for yourself

Strongly Agree	Agree	Disagree	Strongly Disagree

8. In mathematics class, how often do you:

Try to help your classmates solve a problem?
Try to learn things because you want to get a good grade?
Try to learn something new even when you don't have to?
Try to get more answers right than your classmates?

Strongly Agree	Agree	Disagree	Strongly Disagree

9. How much do you agree with these statements about mathematics:

It is important to use the teacher's method
It's OK to make mistakes in work
It is important to avoid looking stupid in front of others
Students are encouraged to try new things
It is good to make mistakes at the board

10. I really enjoy mathematics class when:

The problems make me think really hard
I am the only one who can answer a question
I don't have to work hard
The whole class learns together
I am the first one to get a question right

Strongly Agree	Agree	Disagree	Strongly Disagree

11. When I try hard in mathematics it is because:

I want to get a good grade
The work is interesting
I want to learn new things
I want my classmates to think I'm smart

Strongly Agree	Agree	Disagree	Strongly Disagree

12. Put these aspects of mathematics in order of importance – put a 1 by the most important, a 2 by the 2nd most important, a 3 by the 3rd most important, a 4 by the 4th most important and a 5 by the 5th most importance.

	memorizing facts and rules
	learning to use calculators and computers
	understanding big ideas
	finishing lots of work
	helping others learn