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Experiences of Adults with Developmental Disability and a Teacher of Mathematics in the Money Club

Anthony Matthew Rodriguez

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**EXPERIENCES OF ADULTS WITH DEVELOPMENTAL DISABILITY AND A
TEACHER OF MATHEMATICS IN THE MONEY CLUB**

BY

Anthony M. Rodriguez

B.A., American Studies, Western Connecticut State University, 1999
M.A., Special Education, University of New Mexico, 2000

DISSERTATION

Submitted in Partial Fulfillment of the
Requirements for the Degree of

**Doctor of Philosophy
Special Education**

The University of New Mexico
Albuquerque, New Mexico

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Dedication

I dedicate this work to my children Madalyn Juanita Rodriguez, 6 and Ivan Lapaz Rodriguez, 3. I wish you the best that life has to offer. I especially wish you both a passion for work, dedication to family, and curiosity in many things. I love you both so very much, for you are my inspiration to be a better person.

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ABSTRACT

In my experiences, students with *Developmental Disability* (DD) are routinely excluded from Algebra and other high-level mathematics courses. People with DD do not have the opportunity to learn Algebra, which may support the understanding and provide purpose for learning money and budgeting skills that, perhaps, could help them avoid financial difficulties as adults. The purpose of this study was to investigate the experiences of young adults with DD and me, their teacher researcher, about mathematics, finance, and self within a 6 week program of instruction titled *the Money Club*. This includes how adults with DD reason, apply, perceive, and solve applied mathematics problems in finance.

Most of the mathematics research published in peer-reviewed journals has involved students without disabilities. Very few research articles focus on individuals with DD and mathematics. When students with disabilities are included, the focus splits primarily in two places: Students with “mild” disabilities and their access to general education curriculum and students with “severe” disabilities and their access to concrete operational mathematics or

basic, remedial, mathematics. The experiences of people with DD learning applied finance using algebra, as a support for understanding is a new frontier for study.

Access to general education curriculum is not only a federally mandated law, but also a core interest to me as an educator. I want my students to learn what everyone else is learning, go places everyone else is going, and do things side by side with other people. Many people with DD do not learn algebra (even if the course title is Algebra). They will focus on basic skills, life skills, and non-skilled labor-intensive processes. I wanted people with DD to have access to higher mathematics and extend their life skills to include it.

In high school, people with DD learn basic mathematics and life skills, which consist of adding, subtracting, multiplying, and dividing numbers; or as my peer teachers say, “working on their mathematics skills.” They are taught many of the things I offered in the Money Club at a topical level: saving money, overspending, balancing their personal budgets, and avoiding people who take advantage of them. The Money Club’s difference is that we used algebraic ways of thinking to accomplish these goals: Use of variables, function tables, graphs, matrices, and other higher order mathematics concepts and skills. We demonstrated exactly what happens mathematically when they do not balance their budget, spend too much, take out a bad loan, use a high interest credit card, go to the pawnshop, or invest their money. The Money Club provided a gateway to higher mathematics through an immediately interesting subject: Money.

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Chapter 1: Introduction to Experiences of Adults with Developmental Disability and a Teacher of Mathematics in the Money Club

Problem Statement

In my experiences, students with *Developmental Disability* (DD) are routinely excluded from Algebra and other high level mathematics courses. People with DD do not have the opportunity to learn Algebra, which may support the understanding and provide purpose for learning money and budgeting skills that, perhaps, could help them avoid financial difficulties as adults. The purpose of this study was to investigate the experiences of young adults with DD and me, their teacher researcher, about mathematics, finance, and self within a 6 week program of instruction titled *the Money Club*. This includes how adults with DD reason, apply, perceive, and solve applied mathematics problems in finance. I wanted to learn in particular: 1) What specific experiences affected the beliefs, perceptions, and classroom actions that emerged for participants and their teacher during the Money Club. More specifically: a) What themes emerged concerning people with DD as participants? b) How did the experiences – the beliefs, perceptions, and classroom actions impact instruction and planning from the teacher/researcher? c) How are spending habits and financial abuse by others addressed by higher level mathematics for people with DD? and d) What specific supports within mathematics instruction were used to deliver the information?

I contend that experiences are a combination of the beliefs/perceptions of the individual and teacher as well as the actions or ‘what happens’ within a mathematics classroom. I chose to use the term experience as a broad net to capture all the things that were happening during this study. Oftentimes what the students perceived about themselves

did not align with their actions. Perceptions and beliefs changed daily and their corresponding actions began to change as well. As a teacher/researcher, I began to see how the support of the classroom, actions of problem solving, engagement of the students, and proper support of the learning all interacted to influence individuals and the class as a whole. Under a broad umbrella of experiences, I investigated the beliefs/perceptions, and classroom actions of the people with DD and their teacher in a money club. I also wanted to observe how participation in a higher-level mathematics program addressed some of the main financial issues expressed by the participants: Spending habits and financial abuse by others. The specific supports for delivery of the mathematics instruction also were explored within this study.

In this section, I will state the rationale for studying the learning of algebra and finance for adults with DD. I will detail the reasons for studying the impact of independence and classroom norms for this population. I then searched to find the proper supports to teach algebra in the teacher experiences in the classroom section and mine the motivations and beliefs of the individuals who participated in the research. I then discuss teacher skills and mathematical understanding through the process of how to teach real world problems and develop reform based mathematics practices for people with DD. I then examine the school experiences of students and the possibilities for change. Finally, I examine my initial conjectures, planned teaching and learning for the Money Club and the importance of teaching mathematics and money skills to people with DD.

Rationale

Most of the mathematics research published in peer-reviewed journals has involved students without disabilities. Very few research articles focus on individuals with DD and mathematics. When students with disabilities are included, the focus splits primarily in two places: Students with “mild” disabilities and their access to general education curriculum and students with “severe” disabilities and their access to concrete operational mathematics or basic, remedial, mathematics. Since I am ultimately interested in algebra achievement and understanding for people with DD, this study on their experiences is a first step in that direction. The experiences of people with DD learning applied finance using algebra, as a support for understanding is a new frontier for study.

Independence and classroom norms. Classroom sociomathematical norms are “communal norms and the student’s mathematical beliefs and values” (McClain & Cobb, 2001, p.239). The teacher guides the development of norms with the students and sets the stage for interactions that promote reasoning, problem solving, and open communication of ideas (Wood, 2001). These norms can encourage independent thinking through positive reinforcement and asking for in-depth explanations of the student’s thinking, as well as the student taking full responsibility for learning (Boaler, 1998). All students can take more responsibility for their own learning, even if it is just a little more, and feel that the results are the fruits of their, not an adult’s, labor.

Encouraging independence and responsibility within a student is a challenging task. The teacher is constantly attempting to anticipate events, reorganize, and find a way to set up learning with the development of concepts situated in real life activities and group problem

solving (Steffe & Kieran, 1994). Once the stage is set the teacher steps back and must watch what unfolds, prodding from the outside of the groups as they develop the solutions and the reasoning behind them. Clearly, the teacher (Cobb, et al., 1992; Kieran, 1994) actively guides the construction of sociomathematical norms. This would seem to be applicable to all people; however, I have witnessed that people with DD are generally not afforded this level of independence or the resulting responsibility for learning. Adults shelter this group from taking risks, sometimes with the best of intentions, but the results are the same as for those without disabilities, for if students are not held accountable, trusted, or given responsibility they tend to develop a belief that they are not accountable, trustworthy, or responsible and take action in line with their beliefs.

Teacher experiences. Teacher beliefs, perceptions, and classroom actions as well as assessment drive instruction, and can influence students' understanding of what it means to do mathematics (Boaler, 1998; Ernest, 1989; Fennema et al., 1996). Teachers are also influenced by daily practice and professional development (Fennema et al., 1996). When classroom curriculum and learning within the classroom break down, it is an ideal opportunity for teachers to change and improve, if they look at the situation honestly (Cobb et al., 1991). Past experiences influence the way teachers educate their students, which can be dependent on how open teachers are to their own observation, re-organization, and reconstruction.

Teacher experiences in collaboration, multiple representations of problems and their solutions, and co-construction of knowledge within groups can have powerful effects on the learner. The use of manipulatives (Mayrowetz, 2009) and other ways to model problems can

support learning, while differentiating what counts as acceptable knowledge. Teamwork within communities of practice can ensure support of students' mathematics understanding by changing the purpose of learning from self-centered to group centered, which includes a change in definition of what it means for the group to be successful. In this study, I searched for answers in this area. I studied the changes that occurred during the experience of the Money Club about mathematics and self.

Motivations and beliefs within communities of practice. Beliefs and motivations for practicing mathematics are connected (Cobb, 1985). Students' beliefs can be influenced by what we, as teachers believe, for students are experts at reading teachers' expectations and replicating them. How we develop the norms within our communities of practice can set the trajectory of classroom learning. Belief that the student's learning is totally dependent on the teacher can motivate students to be passive learners, with no power over their environment (Miller & Mercer, 1997). This situation can be found in many segregated classrooms, where all the doing in the classroom is performed by the teacher, leaving the classroom to look like the interior of a movie theater with students as passive audience to the teachers' action. The teacher can also change this by stepping back and expecting that all students will learn, moving in to help at critical moments, then retreating into the background or to another student in need.

Teachers can engage their classes and create active learners by allowing students to use their own understanding of mathematics to solve problems (Wood, 2001). These improved classroom actions can lead to changes in beliefs and perceptions within the student and teacher. Students with DD can use their prior knowledge to solve problems in their own

way, increasing mathematics confidence. Students in problem centered classrooms, where the students can use their own ways of understanding, have shown to do better on standardized tests and tests of conceptual understanding, which influence their confidence that they can solve problems using their own strategies (Wood & Sellers, 1996). Increasing students' confidence that they can solve problems they have not seen before, drives the motivation to solve, rather than give up on, a problem.

Zucker (1995) studied mathematics practices in the classroom actions of high poverty schools and found that teachers still focused almost exclusively on computational basics, ignoring teaching for conceptual understanding. He outlined strategies for 'maximizing meaning' including teaching conceptual understanding of ideas and procedures while broadening the range of content. He encouraged discussions and many representations of ideas. Zucker found that many teachers avoided teaching mathematics in primary classrooms, leaving as little time for teaching it as possible because they are uncomfortable teaching mathematics. When they decided to teach, they used rote-learning strategies exclusively. Successful teachers embraced the combination of teaching skills and understandings, eventually abandoning the textbook, stating, "there is not much in there for them" (Zucker, 1995, p. 59). The dichotomy of teaching skills versus understandings is a false one.

Expecting high standards of learning, the teacher should embrace the yin and yang of mathematics (skills and conceptual understandings) using relevant real life applications. This study underscores the findings in Nye et al. (2004), where teachers in elementary grades were twice as influential in the teaching of mathematics as they were in teaching reading. In the middle and high school grades, students are placed in different classrooms with different

teachers for the core subjects, which may result in different learning. In elementary school, the teacher organizes the schedule of classes and can, as seen by Zucker (1995), avoid teaching mathematics and fit it in when they can. This study looked into the experiences of participants with DD to see if this rings true for them.

Teacher skills and mathematical understandings. Educators who teach students with severe disabilities focused on skill acquisition and maintenance (Baroody, 1984, 1986, 1988; Browder & Grasso, 1999; Kortering, deBettencourt, & Braziel, 2005; Martinez, 1998) which is a lower level of mathematics understanding and does not transfer well to new situations. Research on teaching students with severe disabilities to read at high levels is equally difficult, yet has been shown to be effective (Katims, 2000; Browder, Wakeman, Spooner, Ahlgrim-DeLzell, & Algozzine et al., 2006). Educators should begin to focus their attention on creating real world, locally driven problems that solve issues within the community. Community problems have immediate interest for the student, which can drive them to engage long enough to work out the problems. Mathematics is active problem solving (Ernest, 1989), and people care about solving those problems that are related to what happens to them every day.

Rivera (1993), argued that we cannot jump on every new reform without looking at how it will influence the students we teach. However, we must try new ideas, research based methods in mathematics, and teach people with severe disabilities in new ways or our teaching skills will become dormant. Students have learned mathematics skills without understanding the underlying concepts (Zucker, 1995); this lack of understanding leads to frustration. Teaching higher order thinking in mathematics, which includes problem solving,

is vital to the understanding of concepts. We must believe that they can learn algebra before our students can expect that of themselves (Martinez, 1998). Teachers need training to teach this population of students adequately.

For teaching and learning mathematics, we can look at the classroom actions and ‘doings’ within the classroom to get a sense of teacher beliefs (Ernest, 1989, p.22). Are the activities focused around problem solving or skill mastery or both? Are the students the ones who are primarily doing the mathematics? Is actively testing ideas, and possibly failing, encouraged by the actions of the teacher?

Prior to this emergent study, I stated that the participants could learn mathematics at high levels in a money club. However, I was specifically interested in their experiences: Understanding the beliefs, perceptions, and classroom actions of those in the Money Club. I planned to teach mathematics at high levels which focused on conceptual understanding and skill acquisition. Through use of the *design experiment* methodology (Cobb, 2003; Cobb & Whitenack, 1996, Stephan & Cobb, 2003), I was able to create problems that are both rich in connections to the real world and specific to the needs of the classroom.

Student experiences. Students’ experiences are influenced by their succession of teachers and those teachers’ expectations, often making these experiences and the connected habits of students hard to break. Students in one study, even after being encouraged to invent strategies for solving problems by the researchers, thought they were “cheating” when they came up with their own answer (Baroody, Ginsberg, & Waxman, 1983). Teachers in the ‘non-project’ traditional classrooms stated that the purpose for knowing mathematics was to “demonstrate superiority over others” (Cobb et al., 1991, p.22). Similarly, in the Amber Hill

School, the students' understandings about mathematics were influenced by their teachers' traditional curriculum of fixed, stable, controlled and ordered ways of teaching (Boaler, 1998).

When teachers reward diligent work on challenging problems solved in multiple ways, the beliefs of the student will change (Cobb et al., 1991; Boaler, 1998). Open-ended problem solving does not imply that teachers are not involved in instruction, for they are influencing student constructive efforts at all times. Learning is active construction (Cobb et al., 1992). When teachers hold everyone accountable for learning challenging problems, the critical mass of the classroom begins to shift from apathy to empowerment. I hoped that these things would happen.

Expectations, attitudes, and beliefs. With half as many students with Learning Disabilities (LD) having attended college as their non-disabled peers (Kortering et al., 2005) and with algebra known widely as the gatekeeper of post-secondary access and success, I believe that high expectations and diverse supports for students with severe disabilities will become more important for their future success. In one study, very few students with severe disabilities had the ability to control and balance their finances (Browder & Grasso, 1999). I believe that educators need to expect more from these individuals with severe disabilities and provide proper accommodations, modifications and other forms of support. Rich, relevant, and difficult mathematics problems that are clearly stated and taught conceptually will yield great answers and cause students to work through the struggles that come with all deep learning.

Students with severe disabilities proved that they could learn stable order principle, components of cardinality, purchasing of goods, and comparison of numbers in past studies (Baroody, 1986, 1988; Broome & Wambold, 1971; Browder & Grasso, 1999). In one study, a girl in high school, with a mental age equivalent of 6.5 (IQ 45) proved she could solve components of algebra expressions (Martinez, 1998). Students have invented strategies for counting and solving algebra problems (Baroody, 1984; Martinez, 1998). The work of Baroody in particular addressed the core components of learning mathematics, yet not mathematics as a whole. Only through a change in current teacher experiences, will a change in actions and expectations take place in the classroom for students with DD and support the development of the concepts for the students to be successful. A change in beliefs can trigger a shift in motivations (Cobb, 1985), which can lead to a higher level of mathematics achievement.

Subsequently, once teachers think that students with DD can work at higher levels, even if that means just a little more, over time those incremental gains can compound, making all the hard work worth it for the student. Research has shown that students with severe disabilities are placed in skills only classrooms (Zucker, 1995). Research has also shown that when students are taught skill and procedure only, they lack an important component of mathematics mastery (Hiebert & Carpenter, 2005). If best practice for general education is balanced instruction, could it be that students with DD would benefit from instruction in this manner? I explored the experiences of the participants as well as my own.

Initial Conjectures Prior to the First Class of the Money Club

Teacher conjectures. Prior to teaching the Money Club in the summer of 2010, I had been a classroom teacher for students with disabilities for 11 years. I have taught mathematics in both self-contained and inclusive settings in all grades K-12, at rural and city schools. My classes included students with varying degree of disability. However, I designed and implemented this project having never taught adults with disabilities who were out of high school. My thinking was tempered by prior work at a teen homeless shelter where I tutored for a year. I knew this would be hard work. I knew that I might fail and that no one at the league had to attend even one of the classes (just as at the shelter). If no one showed up, I would need to write another research proposal. The Money Club would have to engage the participants immediately and show real value or the next class I would be talking to myself in an empty room. Many people do not view spending six weeks learning mathematics over the summer to be an exciting experience, and just like teaching mathematics everywhere else I had to sell the importance and excitement of mathematics and deliver every day. My program had to be both enjoyable and helpful.

I placed my belief in the Metropolitan League of Self-determined Individuals' resilient nature and my own ability to seek out challenges and deal with adversity. Even with this going for me, I was a frightened individual. With all of my studies behind and a dissertation in front of me, I was thinking I put too many eggs in one basket and that interviews alone would be a safe and appealing alternative to this high wire act of teacher-researcher. I thought that the study provided a unique opportunity to learn about adults with DD and how they do mathematics. Finally, I wanted to influence a group of people on the

virtues of mathematics and if applied well, how it can steer them away from bad money decisions and keep more cash in their pocket.

Planned learning for the Money Club. I originally wanted to use the Money Club as a mathematics/money training to be used by the league for training modules. Two years prior to the Money Club, I was a student in SPCD 524: Advocacy and Empowerment with Individuals with Mental Retardation or Severe Disabilities, where we worked at the Metropolitan League of Self-determined Individuals. There, I first met Destiny Campos, the director of the league. I spent many weeks working with an adult with DD on a training module titled “How to get your program funded by the Legislative Finance Committee”. I thought that the Money Club could generate many training modules for the league to train others on a financial topic of their choosing.

Planned teaching for the Money Club. I created a week-by-week outline for what I wanted the participants to learn during the Money Club. I wanted to wrap the concepts and skills of mathematics and finance around the frame of money management. I created titles for each week: Developing concepts and pre assessments of prior knowledge; Discovery learning with supports; Patterns using algebra; Compounding interest; Saving, Investing, and Scams; Final project and post assessment. In alignment with the design experiment, I wrote only the first day’s lesson plan prior to the study. I felt unprepared to teach the first week because I am used to planning in two-week cycles and wondered how I could turn around and write each lesson plan the day before teaching it. I asked myself: How would I adjust and would this be a good way to teach in the future?

I was intrigued by the seemingly improvisational lesson planning technique within the design experiment, where I must read and react day by day, moment by moment, to the actions within the classroom. To report daily results and experiences, which then generated a new lesson plan to be judged and critiqued that same day astounded me. This process reminded me of learning how to teach all over again – I would have to take nothing for granted and be cognizant of each action in the classroom and its consequence. It reminded me of when I was in a bike accident and had to relearn things that I had been proficient at previously. I knew it would be frustrating to have to walk through each action in detail so that I could learn from it later in the improved lesson plan. Normally, I intuitively react to my class and make adjustments without thinking why I am doing it. This opportunity for learning to teach again as a novice was an exciting task.

Why teach mathematics and money skills to people with DD? Access to general education curriculum is not only a federally mandated law, but also a core interest to me as an educator. I want my students to learn what everyone else is learning, go places everyone else is going, and do things side by side with other people. Mathematics is an unexplored frontier for people with DD, especially in the area of algebra. Many people with DD do not learn algebra (even if the course title is Algebra). They will focus on basic skills, life skills, and non-skilled labor-intensive processes. I want people with DD to have access to higher mathematics and extend their life skills to include it.

In high school, people with DD learn basic mathematics and life skills, which consist of adding, subtracting, multiplying, and dividing numbers; or as my peer teachers say, “working on their mathematics skills.” They are taught many of the things I offered in the

Money Club at a topical level: saving money, overspending, balancing their personal budgets, and avoiding people who take advantage of them. The Money Club's difference is that we used algebraic ways of thinking to accomplish these goals: Use of variables, function tables, matrices, and other higher order mathematics concepts and skills. We demonstrated exactly what happens mathematically when they do not balance their budget, spend too much, take out a bad loan, use a high interest credit card, go to the pawnshop, or invest their money. The Money Club provided a gateway to higher mathematics through an immediately interesting subject: Money.

Many teachers will argue that people with DD need to learn basic mathematics skills to mastery. They will contend that if the student has not mastered the basics they will not benefit from an algebra program. My argument is that algebra is just generalized basic mathematics and an algebra program can be taught to anyone on any level; algebra strengthens basic skills. The teacher can adapt and modify the context and concepts learned to bridge the prior knowledge of the individual to the algebraic learning within any classroom. By increasing expectations, if only by a little, the individual paves the road to higher achievement in other areas too.

Many teachers will argue that people with DD will never use algebra and with all the things they could be teaching, they should narrow curriculum to skills that will be applied in the future. My conjecture is that none of us knows what will and will not be used in the future and we need to prepare well. I clearly remember the day I applied the concept of similarity found in algebra I and geometry. I was 18 and worked for a tree company and we were attempting to drop a tree of unknown height. A house sat within 30 yards of the tree on one

side and power lines were 10 yards away near the street and rose 20 feet high in the air. On the left and the right of the tree were gardens that I would have to avoid. We used my shadow and that of the tree, and knowing how tall I was, compared the two shadows and found the height of the tree and we could easily drop this tall tree without hitting the house. I never would have known this if someone had not taught me concepts of similarity.

Algebra is also something that many students with and without disability are afraid of until they try it. Some believe that no student in their right mind would agree to learn algebra, the gateway and sometimes gatekeeper to higher mathematics and to college (Chambers, 1994; Moses & Cobb, 2001), without the coaxing and support of a skilled teacher. Algebra can make cowards of the most confident persons, kicking in their natural reflexes of flight and aversion from uncomfortable stimuli. Fear of mathematics is real for many people, but I do not believe it is an excuse for not exposing people with DD to it, just another challenge to overcome.

Conclusion

The past experiences of people within mathematics classrooms affect what teachers as well as students do, what counts and what does not, and for what purposes we engage in mathematics. Students' and teachers' experiences in some classrooms include the construction of their own learning (Cobb, et al., 1992; Kieran, 1994); while in others they use mathematics to dominate their environment and show superiority over others (Cobb et al., 1991). Some students are convinced that inventing strategies is equivalent to cheating (Baroody, et al., 1983). In other classrooms, inventing new ways to solve problems is lauded by their teachers (Wood & Sellers, 1996). In some places, classroom norms for operating are

mutually constructed, which develop and can change the thinking of both student and teacher (Fennema, et al., 1996; Wood, 2001). The experiences of students are powerful indicators of what mathematics means to them.

Many students with DD have similar experiences as those in research on general education students. They rely on the teacher for all things, give up on problems before they start them, and have strong pre-dispositions to not enjoying mathematics. The questions before embarking on the study remained: Will a study on the experiences of students with DD produce similar or different results? Will the practice of mathematics in a money club for adults with DD influence their experiences as it has in other studies on students without disabilities (Cobb et al., 1991; Boaler, 1998) as it relates to my initial research questions?

In the next chapter, I will review the literature in the areas of *mathematics problem solving and instructional supports for people with DD, money habits, scams, self-determination, empowerment, and self-advocacy* and tie in the major frameworks that informed the research of the Money Club.

Chapter 2: Literature Review

Introduction

There is a large gap between the number of studies in reading and those in mathematics, with many more studies in reading. The gap widens when considering the number of studies conducted with students with DD. This large gap in research may be reflected in the larger number of highly qualified language arts teachers compared with the number in mathematics. When teachers are more competent and comfortable in one subject, such as language arts, they will focus their energy in that place, leaving time for students to learn mathematics in the last block of the day ‘if time permits.’ There is also prevailing practice where students with DD will learn mathematics only at a basic concrete level or as part of a life skills class. Although life skills are important and vital, I want to encourage a genuine mathematics experience for this population. This study challenges existing practices by suggesting that students with DD should be exposed to a rigorous course on scams and finance, using algebra as a crucial support for understanding.

I chose to study the mathematics experiences of people with DD because I am interested in getting to the root of mathematics performance. I view experiences as a foundational structure for learning mathematics and including conceptual understanding and procedural skill in performing at high levels. I want to understand the experiences of the participants and self within the Money Club so I can better teach students with disabilities in the future. I found one study that specifically focused on students with DD learning algebra, (Martinez, 1998) in inclusive settings, which brought hope. In this study, however, the students were engaged in skill only activities, which is consistent with the low expectations

other studies on mathematics learning have shown in teaching this subject. Among the studies I reviewed, I have yet to find a single study that mined the experiences of people with DD in learning algebra.

In this chapter, I will extend the discussion on experiences to include (a) the theoretical frameworks which have impacted my own experiences on the teaching of the Money Club, (b) *mathematical supports* for teaching and learning within the Money Club, and (c) the literature related to the themes of the Money Club which include problem solving, scams, money habits, and empowerment of individuals with DD. This literature review informed and shaped the study. I begin with the theoretical frameworks from which my teaching has grown, and how my experiences have been influenced, which in some way changes the context from which the participants view mathematics within money club.

Theoretical Framework of Foundational Beliefs

Cognitive science: Mathematics teaching and learning. *Cognitive science* related to mathematics teaching and learning impacted my own teaching when I began to study the areas of the brain affected by *traumatic brain injury* (TBI) in students in my own classroom. I wanted to understand how the brain was affected by trauma and how to rehabilitate the learners in my classroom in order to learn basic skills. At the time, I was not aware of the concepts of *brain plasticity*, *neurorehabilitation*, and *successive approximations*. Through intensive study, I began to believe that if stroke patients and those with TBI could regenerate skills, then my students in a mathematics class for students with disabilities could slowly build skills over time. The review of literature regarding cognitive science relates to my experiences in brain plasticity and gradual improvement for students with DD.

Bridging. Bridging refers to the idea that all students have prior knowledge, which a teacher can access if the teacher helps the student build connections between what the student knows and the formal mathematics the teacher wants them to learn. It is an access point from the suburbs of partial understanding to the city of complete and formal instruction across the river. In one study, many students arrived at school without the formal English that was required to be successful in school, specifically in mathematics (Brenner, 1998). Language skills and understanding improve with more time and increased content (Jensen, 2000). Working from the students' partial understanding of mathematics language and slowly building mental bridges to the mathematics specific language of school, helps students increase learning in mathematics. Students can be successful in mathematics if we bridge the language they understand with the language that we want them to know (Brenner, 1998).

Mathematics teachers can take the student's informal mathematics skills and connect these skills to formal mathematics class work (Brenner, 1998; Hiebert & Carpenter, 2005). Teachers have taken the strengths of students and planned curriculum around them, meeting their unique needs (Brenner, 1998). Using a student's prior knowledge to create and shape future understandings strengthened the connections to that information. Understanding mathematics concepts increased retention by chunking information together, which made the retrieval of that information easier (Hiebert & Carpenter, 2005).

Shaping. Repetition of desired results builds capacity in the learner (Jensen, 2000; Taub, 2004). Increased learning stabilizes synaptic junctions, and creates strong pathways to the information stored in our minds (Leamson, 2000). When teachers slowly shape and support the learning of mathematics toward the desired outcomes, they build a strong

foundation of knowledge in the student upon which the student can draw in future learning situations.

Past knowledge and information taught to the student, shape future responses and learning (Brenner, 1998; Leamnson, 2000; Zull, 2002). Solid, exciting, and understandable mathematics teaching can support active learners who continue to grow and search for new ways to solve problems. Each student in class arrives at school with a different understanding of mathematics. Teachers are constantly shaping that understanding, setting the stage for future learning.

Our past experience influences our future outcomes. People participate in daily activities with the lingering effects of their previous experiences and learning (Zull, 2002). People solved new problems employing their prior ways of solving similar problems. Sometimes through non-use of skills, patterns of escape and avoidance emerged. Overcoming these barriers to new learning was a challenge (Taub, 2004). Even when the students in class stonewall our efforts to teach them, we must continue to have high expectations and support their learning along the way. Breaking habits and activating dormant skills leads to future learning.

Mathematics is well known as a negatively stigmatized subject (Leamnson, 2000), and must be taught in an engaging and challenging way to overcome this perception. Many Native American populations are uncomfortable in school because the school personnel did not embrace and learn from the students' culture (Brenner, 1998). To change the perception of school and mathematics education, teachers helped children master content with community-practiced activities.

Brain plasticity and organization. Brain plasticity refers to how malleable and repairable our mind is, for we are perpetually learning from past actions and creating new experiences (Dewey, 1916) and our memory is constantly being constructed (Hiebert & Carpenter, 2005; Jensen, 2000; Leamnsen, 2000; Taub, 2004). With each new skill learned, students' prior understanding is changed, rewired and will influence future growth. When teachers build upon what the student already knows, they connect and strengthen pathways in the brain. Teaching is a way to rewire and improve brain function. We can activate networks that are not used to working, and through practice can hard wire those connections for future access.

Using neglected areas of the mind organizes the connections within our brain (Taub, 2004). When students tell me that they 'can't do mathematics' or that 'they are not mathematics people' I tell them that they do not know yet. Working on students' incomplete understandings while building confidence in mathematics allows students to take risks. They need a lot of support during times of doubt. High expectations only work if teachers support students when they struggle, not giving in to the fear, but showing that they understand what they are saying and that they will still overcome it.

Emotional involvement and learning. Emotional involvement in learning also strengthens pathways and increases memory retention and recall (Jensen, 2000; Leamnsen, 2000; Zull, 2002). What students are interested in they will remember. If students are taught mathematics skills in an enjoyable, engaging, and exciting way, they will learn that information better. In past studies, interests sparked emotional portions of the brain, which

flood the brain with signals of the activity, with increased retention and learning (Jensen, 2000; Leamson, 2000; Zull, 2002).

Concrete experiences were directly processed by the amygdala, the fight or flight, danger-detecting center of the brain, and then sent to the sensory cortex (Zull, 2002, p.59). This means that we form immediate perceptions of what will happen next when we enter the classroom or learn a new thing, which emphasizes the importance of initial teaching math concepts for future learning. Teachers can minimize fear of mathematics by building a history of trust with the students that they will always support them, push them, and everyone will learn.

Hard work and supportive teaching. Students will also work hard and take risks when they feel supported and engaged by the community of learners. “This combination of challenge and support seems optimal for learning” (Zull, 2002, p.235). Students learned from each other (Brenner, 1998). Students with disabilities have learned challenging subjects like algebra (Hutchinson, 1993b). Slowly bringing students toward a goal builds confidence and allows them to take credit for their own learning. Students want to earn the good grade, work for the knowledge, and show people how smart they are. Teachers need to listen to their needs, support their understanding and sometimes, step back and let the group run on its own.

Deweyan pragmatism and experience. Dewey is included in this literature review on experiences for his theories regarding how all knowledge is created through direct experience and the position of the individual within the world, learning, education, inquiry, and problem solving as it relates to the teaching and learning of mathematics. The ideas and

beliefs he had almost a hundred years ago are relevant to teaching in a time of increased demands for “scripted” teaching.

Experiences. Experience changes us and influences future experiences in similar situations; it modifies what we think and do (Kolb & Kolb, 2005; Hall, 1996). Within my teaching practice, I have listened to parents speak of negative mathematics experiences for students with disabilities being so common that many parents will brush off failure in mathematics as an inevitable part of their child’s schooling. If all learning comes from experience (Dewey, 1938), then setting the stage for positive experiences in mathematics education can change the thinking of students, increasing the likelihood that they will see mathematics in a positive light, which is a first step in improving their understanding and skills.

Experience is the crossroads of the individual and the environment (Hall, 1996). Experience is exponentially more powerful than theory, “An ounce of experience is better than a ton of theory...” (Dewey, 1916, p.169), for experience is a combination of theory and practice (Dewey, 1938). Communicating our experience with others builds understanding and ownership with what we have learned collectively, creating community (Dewey, 1916). The Money Club’s primary objective was to be a positive mathematical experience, with many complete learning cycles (Zull, 2002). Below are the three components of experience.

Beliefs. The beliefs of people within mathematics classrooms affect (a) What counts as mathematically relevant practices, (b) what it means to ‘do’ mathematics, (c) the purpose for which mathematics is constructed, and (d) its value to students’ lives and to the world around them. Beliefs in students are often viewed as stable constructs and have been found

to change little in longitudinal studies (Klosterman, Raymond, & Emenecker, 1996).

Challenges for classroom teachers emerge when they attempt to reform practices and find that the beliefs of the students become roadblocks to high-level mathematics achievement.

Mathematics beliefs are comprised of four domains: Beliefs about mathematics, beliefs about self, beliefs about teaching, beliefs about social context (McLeod, 1992). In the pre and post interviews of this study, I focused on two of the four domains with participants in the study: beliefs about mathematics and beliefs about self. Beliefs about mathematics will have two subtexts: Pedagogical beliefs about mathematics and personal beliefs about mathematics. I chose to select these subtexts because I believe that one must first work on the beliefs of the individual regarding mathematics in order to break open the glass ceiling to higher achievement and work on the other two.

Ernest (1988, 1989) asserted that in a time of reforms, teacher knowledge, beliefs and attitudes were ignored. Thoughts in particular, including teacher thought processes and structures, are of paramount importance in the classroom (Ernest, 1989). Thought processes include planning, day-to-day decision-making, and sustained reflection. Thought structures are knowledge, beliefs, and attitudes. Ernest extensively studied thought structures, referring to them as the ‘missing program’ (Ernest, 1989, p. 14).

Perceptions. Students and teachers in some classrooms perceive that learning is a constructive process (Cobb, Yackel, & Wood, 1992; Kieran, 1994), while in other classrooms learning is a means to dominate the environment and show superiority over others (Cobb, Wood, Yackel, Nicholls, Wheatley, Trigatti, & Perlwitz, 1991). Some students perceive that they are cheating if they invent ways to solve problems (Baroody, Ginsberg, & Waxman,

1983). In other classrooms, inventing new ways to solve problems is lauded by teachers (Wood & Sellers, 1996). The teacher/student interactions create class norms for operating which develop and can change the perceptions of both teachers and students (Fennema, Carpenter, Franke, Levi, Jacobs, & Empson, 1996; Wood, 2001).

There is widespread thought that students, after successfully completing high school and many years of mathematics instruction, cannot solve mathematics problems outside the context of the classroom (Boaler, 1998). Some argue that all learning is situated within the context of where the learning took place and the interactions within the classroom environment, making it impossible to remove the context and interactions when the learning is recalled later (Lave, 1985).

This may be why The National Council of Teachers of Mathematics (NCTM) promotes that all students should solve real world problems every day in novel ways (NCTM, 1989). All students, per NCTM, really means all students, which include those with disabilities. However, there is a paucity of research for students with DD solving problems at the level of algebra and beyond. Adding to this knowledge/research base is vital. I believe it is time for students with DD to gain access to rich mathematical understandings afforded to those without DD.

Classroom actions. Students with DD should be allowed to think creatively when doing mathematics, to take control of their own learning, and to be successful (Miller & Mercer, 1997), just like students without disabilities. It has been found that students whose learning is aligned with reform mathematics practices perform better on standardized tests (Boaler, 1998). Many students with DD in school today are not required to take the core-

standardized tests, and thus, research on achievement in higher-level mathematics cannot be gauged at this time.

Nye, Konstantopoulos, and Hedges (2004) concluded that the classroom actions of the teacher, or teacher effects, within a mathematics classroom in grades 1-3 are almost twice as large in mathematics as compared to reading. These effects of the teacher on the learning of mathematics can place an enormous responsibility on the actions of the mathematics teacher. In this study, I looked at the changes, not effects or causes. I used interviews, notes (design notes form), lesson plans, and vignettes from taped class sessions to have a deeper understanding of the experiences of people with DD and their teacher in mathematics.

In this study, I will focus on the experiences of people with DD and teacher, which include but are not limited to, the beliefs, perceptions, and classroom actions within a money club. Problem solving, money habits, scams, and empowerment components within the above-mentioned research are described as emergent themes. I explored changes in beliefs, perceptions, and/or classroom actions in this study. I hoped to find new teaching and learning supports to address the needs of learning higher-level mathematics, including algebra, applied to finance.

Continuity vs. dualism. Dewey did not believe in the dual nature of ideas or the creation of knowledge, which dominated the thinking of the times; in fact, he rejected it (Dewey, 1938; Glassman, 2001b; Popkewitz, 1998). He saw the dual nature of things as barriers preventing citizens from freely communicating with each other (Dewey, 1916). These divisions separate us from the world around us, limiting what we can learn. Everything and everyone is connected in society and our learning should mirror those

connections. Teaching and learning mathematics can also be taught consistent with Dewey's ideas that are in a community-based program grounded in high expectations and diverse supports.

Dewey (1938) stated, "Mankind likes to think in terms of extreme opposites". He was discussing our natural instincts to categorize and sort all things into good-bad, right-wrong, either-or, and thinking-doing brands of philosophy. Stressing the *continuity principle*, Dewey stated that thinking and doing were connected (Dewey, 1916; Kolb & Kolb, 2005; Rorty, 1992). As the person who was simultaneously solving a problem, while thinking of how that problem will be used in the future (Dewey 1938; Rorty, 1992), this person was considered to be backwards planning.

Inquiry. Sustained quiet reflection was necessary to gain understanding of an action (Dewey, 1938). Reflection helped organize and create new knowledge within the individual after a concrete educational experience (Hall, 1996; Kolb & Kolb, 2005). After we stretch our minds to the limit, it is important to sit back and think about what we have just experienced and its relation to our lives, both in the present and in the future. Solving problems forces individuals to reflect upon what they are doing (Rorty, 1992). Thinking is synonymous with acting (Tanner, 1988).

When we ask students to learn from us and think critically we are asking them to take risks, not sure if they are going to get the right answer, yet doing it anyway. We build trust with students, convincing them to believe that in the end we will all have a better understanding of the material, but "All thinking involves a risk." (Dewey, 1916, p.174). Inquiry and critical thinking are the same (Tanner, 1988); both require us to contemplate

deeply both within us and around us. We emerge from this space of thoughtful reflection, a newly constructed individual with a rebuilt intellect more capable of solving novel problems (Kolb & Kolb, 2005).

Education. Teachers are expert “guides” (Tanner, 1988, p.476), who “furnish the environment” (Dewey, 1916, p. 212; Dewey, 1938, p.27) which stimulated, motivated, and directed the learner on their path (Hall, 1996; Prawat, 1996). Teachers need to know when to teach, when to lead, and when to step back and let the student do the work. Supporting student learning does not mean that we do the work for them; they need to know that what they are doing is challenging, yet know that we are there to help as needed. Teachers are not there to tell a student anything, but to construct learning with them (Dewey, 1916; Popkewitz, 1998).

The opportunity to take risks and make mistakes was deemed vital to the learning process (Dewey, 1916). Learning is predicated on trial and error and if teachers are feeding skills to them without building understanding within them, we are setting them up to fail in real situations. Without a resilient inner structure, new skills cannot attach, and we learn little. Dewey wrote about plasticity long before the cognitive science community ran magnetic resonance images (MRI) scans of our brains. He suggested that we all have the potential for brain plasticity, learned from our actions, and created new experiences. He stated that what we do was a habit and we changed these habits by doing the things that are good and important to us; for teaching should be about creating good habits in our students (Dewey, 1916).

When developing mathematics understanding in the classroom, the teacher must differentiate instruction (Kozulin & Gindis, 2007), creating many models and rich mathematics problems (Pape, Bell & Yetkin, 2003). NCTM states that their standards are designed for all students including students with disabilities (Forman, 2007). Accordingly, students with DD can learn with their peers, for discourse is a vital component of mathematics education (Pape et al., 2003). Learning is socially mediated (Gutstein, 2003). Furthermore, teachers need to reflect on their teaching so they go beyond how they were taught as students (Cobb & Yackel, 1996) to create better learning environments for future generations.

Community and society. Experience is socially constructed (Dewey, 1938; Popkewitz, 1998). We learn with contact from our environment and from other people. We can walk in the direction we choose while simultaneously picking from the community and environment around us. When we do things, we are working through our ideas, since doing is a component of ideas (Prawat, 1996). “All human experience is ultimately social: That it involves contact and communication” (Dewey, 1938, p.38). In order to learn deeply we need to be with others learning algebra applied to real problems in our community.

The community also acts as an external social control (Dewey, 1938). The community and society create norms, rules and expectations (Popkewitz, 1998) and without these guidelines we could not have a participatory society or “no rules, no game” (Dewey, p.52). The community that is co-constructed by the individual is also a molding device for the individual (Glassman, 2001a). Our classrooms need rules to operate, socialize, and learn

at high levels. The teacher is the external control creating a structure for co-construction from which students learn.

The individual. Teachers who engaged their students in authentic, real world activities understood how challenging the planning process could be (Hall, 1996). Teachers needed to do the tough preparatory work that will support students as active learners (Hall, 1996; Glassman, 2001b). Teaching the students self-discipline is part of engaging them with lessons and getting them to want to know something (Popkewitz, 1998).

The individual also needs to freely experience his or her environment, take risks and learn from mistakes. “We can be aware of consequences only because of previous experiences.” (Dewey, 1938, p. 68). Many students with DD are sheltered and protected from ever having to take risks (Perske, 1972), are unable to work outside their comfort zone, and are never given the chance to improve. Educators worry that if the child fails, he will not be able to recover from the harsh reality of failure. When educators do this they are insulting the capacity of the individual to recover, reconstruct, and succeed in school. Students with disabilities have the right to take risks with their education and learn from them, for that is how we all learn.

The mind, the world, and ideas. The mind and world ‘collide’ in the areas of ideas (Prawat, 1996, 2002). Our actions are components of ideas, for the individual is always in contact with the world (Dewey, 1938). We are social beings and the mind does not stop at the end of our bodies, but extends to the community around us (Prawat, 1996). Solving problems through real activities unites the mind and world through the medium of ideas (Rorty, 1992). Ideas have transformational energy, which can motivate students with

disabilities to solve problems they never thought possible, with proper, well planned, and diverse supports.

Self-regulation and learning. Self-regulated learning is used as a social process requiring the student to think critically (Forman, 2007). Self-regulated learners reflect upon what they do, assess what could be done, and set goals for what they will do in the future (Pape et al., 2003). When the individual continues to deepen his or her understanding of mathematics through thoughtful practice and asking questions it is a component of progressive mathematization (Cobb & Yackel, 1996; Middleton, 1999). Students needed to be encouraged to travel this risk-taking road of continual adjustment within their thoughts. Teachers can support students by embracing disequilibrium in class discussions and seeking new answers to novel problems. In order to remodel a house, an individual must demolish old walls, fixtures, and supports; the same process applies to learning.

Flow Theory. Flow theory searches for everyday happiness in engaged activities, which mines for the motivations of the individuals in everyday activities. Flow is the act of taking on a task that is slightly outside the realm of present skills and understandings (Csikszentmihalyi, 1990). Through the act of taking this risk, the brain is forced to concentrate, center, and reorganize resulting in a feeling of well being, focus, and a high degree of motivation. Flow occurs in any activity (Csikszentmihalyi 1989, 1990; Sheifele & Csikszentmihalyi, 1995; Shernoff, Csikszentmihalyi, Schneider, & Steele-Shernoff, 2003) including mathematics. Shernoff et al. (2003), however, found that flow happened less often in mathematics than in any other subject. This is the charge of mathematics educators, especially if they take on the challenge of teaching students with disabilities, who have not

been exposed to high quality mathematics teaching. Differentiation of subject matter and integration of the environment around us increases the complexity of our thinking and doing (Csikszentmihalyi, 1990). We can improve our classrooms with fewer lectures and standardized testing, with more group and independent work (Shernoff et al., 2003) to increase the engagement of our students.

Engagement and interests. Engagement is the first task teachers must tackle when they begin a lesson. When students are given work that is too easy or too hard, they will detach and become bored or frustrated. When work is challenging, yet supported, students will take the risks necessary to enter a state of flow (Csikszentmihalyi, 1990). They will become more productive locked in this state because they are intrinsically motivated and learn things we never thought they could.

Many people, surprisingly, are more engaged and happier at work that was shown to be both interesting and challenging than when they are in leisure (Csikszentmihalyi & LeFevre, 1989). All the individuals in the study thought that they would be happier relaxing, and looked forward to this time most often. This problem arises in the classroom when students want free time; but when free time arises, they are bored. A teacher who uses students' interests to learn challenging mathematics concepts and skills can create the difference between detachment and failure, full engagement and success. Many things compete for our students' attention throughout the day, so we cannot risk disengagement through the lack of planning on our part; we could lose the student for more than just a day.

The auto-telic self. The “auto-telic self of learning to set goals, to develop skills, to be sensitive to feedback, to know how to concentrate and get involved – is that one can enjoy

life even when objective circumstances are brutish and nasty” (Csikszentmihalyi, 1990, p.212). This ‘ideal self’ reminded me of a self-determined individual, described later in this dissertation, who will reach his/her goals and take on a disposition of toughness. The auto-telic self is the self I want students with disabilities to embrace, bringing out the best within them, transforming their thoughts into beliefs. The auto-telic self is a form of support within individuals who will prepare for the tasks ahead, going forward with a level of confidence needed to reach their goals.

Themes of the Money Club

Within the 6-week design experiment on the experiences of students and teacher in a mathematically driven, financially focused, money club, four themes emerged: Problem Solving Strategies and Mathematical Instructional Supports, Money Habits, Scams, and Empowerment through Advocacy and Self-determination. In this section, I will review the literature in each of these areas – in the areas of money habits and skills there are large gaps in the literature. I will begin with the Problem Solving Strategies and Mathematical Instructional Supports that have been specifically used within the Money Club.

Problem solving strategies and mathematical instructional supports. Problem solving is a core operation within mathematics, one with which people with DD have historically struggled. It is of paramount importance that these individuals be taught at high levels and expected to become expert problem solvers. However, in order to transform students with DD into problem solvers, classroom learning should become a constructive process (Dewey, 1916; Popkewitz, 1998; Vygotsky & Kozulin, 1986). Problem solving requires the individual to become a reflective learner (Hiebert & Carpenter, 2005; Kolb &

Kolb, 2005; Zull, 2002). Thinking and doing have been shown to be connected acts (Csikszentmihalyi, 1989, 1990; Dewey, 1916; Kolb & Kolb, 2005; Rorty, 1992; Zull, 2002); students can deeply think and act through real world, community-based, problem solving. Through this type of problem, solving students connect to their community, working out mathematics problems that they care about, increasing their potential for learning.

Importantly, some research has shown that students with disabilities can work on their weaknesses without thinking and acting within the disconnected skills-only deficit model that pervades much of special education today (Browder, Ahlgrim-Delzell, Spooner, Mimms, & Baker, 2009; Katims, 2000). All people have weaknesses and areas that need improvement. Successful people must overcome obstacles in the way of their goal, including gaps in their emergent skill sets. Students with disabilities are no different. They can overcome issues and learn skills while they deepen their understanding of mathematics, which will create more options for future careers that are dependent on mathematics

Teachers should design real activities in present time for students to learn problem solving. “We don’t look to solve problems of old systems; but to create new problems to be worked out on the basis of a new philosophy” (Dewey, 1938, p.22). Solving real problems can be a frustrating and messy undertaking, but while working through the frustration we must have an adjusting action (Prawat, 1996, 2002), which transforms learning. This adjusting action allows us to escape our prior way of thinking to solve new problems. Individuals must realign themselves in the environment (Rorty, 1992) in order to solve the problem.

Solving real and important problems require the teacher to go beyond drilling and isolated skill teaching to students. According to Dewey (1938), drilling facts and figures into a child weakened their ability to judge future applied problems properly. This may be due to the lack of structure from which upon to hang those skills. Conceptual understanding is the frame to which mathematics skills can attach. In order to learn problem solving, the student must actively work out a problem. Teachers support students when they allow them to transform their own learning, and take responsibility (Hall, 1996).

I also contend that instructional supports are needed when attempting to teach mathematics at high levels, reducing the frustration as well as increasing the probability that the student will continue to be engaged in the activity. What I have found in practice is that students with DD are primarily taught basic skills in mathematics classrooms, when they should be focusing on developing mathematical concept understanding that can later support problem solving (Zucker, 1995). Conceptual understanding in one area of mathematics develops rich relationships that can transfer well to other areas and standards (Hiebert & Carpenter, 2005). Components that support conceptual understanding in mathematics, which will be expanded upon within this section, include prior knowledge (Miller & Mercer, 1997), connecting concrete supports to abstract thinking (Mastropieri, Scruggs, & Shiah, 1991), bridging (Brenner, 1998), and shaping (Taub, 2004). Instructional supports that aid problem solving include scaffolding (Miller & Mercer, 1997; Henningsen & Stein, 1997), composing and decomposing numbers (Fuson, et al., 1997), contextual support (Hiebert et al., 1996; Fuson et al., 1997), and problem solving, which includes invented strategies (Baroody, 1984).

When conceptual understanding and problem solving are solidly supported, the learner has a well-rounded base for succeeding in mathematics.

Although many of the above-mentioned instructional supports worked with students without disabilities (Brenner, 1998; Fuson, et al., 1997; Henningsen & Stein, 1997; Hiebert et al, 1996), in my practice I have found them to be successful with students with disabilities as well, including students with DD. Supports impact instruction, which tangentially influence the experiences of the participants in this study, including myself. Next, I will continue a more detailed discussion on the mathematics supports used in this study. They will be organized under two core ideas: Conceptual understanding in mathematics and problem solving.

Conceptual understanding in mathematics. “Understanding is the goal in mathematics” (Hiebert et al., 1996, p.16). Understanding mathematics concepts is also a foundational instructional support that gives meaning to the procedures and work involved in learning mathematics (Hiebert & Carpenter, 2005). Many students can compute problems correctly and later do not understand the meaning behind the mathematics (Lampert, 1986). Conceptual understanding is rich in relationships and connections, which are helpful in generalization to new problems (Fuson et al., 1997; Hiebert & Carpenter, 2005).

Teaching a concept deeply is vital to building understanding within a student. This understanding connects to the next concepts, building relationships to mathematical knowledge (Fuson et al., 1997; Hiebert et al., 1996). When curriculum spirals, as in certain mathematics programs, many students with disabilities fall behind, due to a lack of understanding, which compounds their difficulties in learning the next concepts, causing

them to fall further and further behind (Miller & Mercer, 1997). Lack of complete understanding results in many fragments of partial knowledge that need to be pieced together, which is more challenging than teaching it well the first time (Hiebert, Wearne, & Taber, 1991; Lampert, 1986).

Teaching for conceptual understanding at a deep level is one of the most effective supports for students learning mathematics (Hiebert et al., 1996; Lampert, 1986; Miller & Mercer, 1997). Concepts are blocks or clusters of information, which are ‘rich in relationships’ (Hiebert & Carpenter, 2005). When mathematics is learned conceptually, it gives the individual a mental picture or structure to wrap skills around, a focal point of the lesson.

Due to a dearth of studies on mathematics and people with DD, this study on experiences will be influenced by the efficacy of the supports needed to teach and learn applied algebra. Instructional supports implemented in the lessons of the design experiment for the teaching of the Money Club have been documented in the design notes form. Design notes forms, lesson plans, as well as taped interviews and class sessions were used to conduct a *retrospective analysis* (diSessa & Cobb, 2004) of the experiences of the adult participants with DD. This retrospective analysis is used to synthesize all the data and develop generalizing principles that can be used in future teaching and research.

Prior mathematical knowledge. Most upper level mathematics programs rely on the mathematics textbook and do not focus on real-life problem solving, which leads to lowered generalizability (Miller & Mercer, 1997). Mathematics problems that do not access the real lives of the students miss an opportunity to connect with the prior knowledge of each student,

which is “the single most important factor” (Hiebert & Carpenter, 2005) in connecting past and present mathematics learning. Linking teaching to students’ prior knowledge increases retention and engagement of the learner.

Scaffolding. Scaffolding is a way for students to get help while working on new problems (Miller & Mercer, 1997). It occurs when students cannot work a problem and they access a more capable peer or teacher, which lowers the cognitive demand upon the students (Henningsen & Stein, 1997). It allows them to work semi-autonomously, building confidence in transit toward completely independent work. Scaffolding allows learners to refine their partial understanding of mathematics concepts. Scaffolding has been found to be a highly successful support for learning (Henningsen & Stein, 1997). Scaffolding in the Money Club was used expertly by the peer tutors within the class.

Invented strategies. Allowing the student to use invented strategies as a starting point in learning mathematics can bridge gaps in learning. Students should be encouraged to create their own way of solving problems (Hiebert & Carpenter, 2005; Brenner, 1998). In Lave (1985), the students were intelligent and solved very challenging problems outside of school, yet struggled solving algorithm driven problems.

Composing and decomposing numbers. Composing and decomposing numbers builds relationships and cognitive supports necessary for learning (Martinez, 1998; Fuson et al., 1997). The techniques also reduce cognitive demand by creating chunks of knowledge, which makes access and manipulation easier. Addition and subtraction are taught as a way of composing (addition/multiplication) and decomposing (subtraction/division) numbers in families. The instructor may show a triangle model of $1 + 2 = 3$, in which addition and

subtraction are considered as a unified whole, that runs clockwise and counter clockwise.

This construct is also a conceptual model for the life cycle.

Contextual support and manipulatives and connecting concrete supports to abstract thinking. Connecting concrete mathematics supports, such as mathematics models, blocks, and other manipulatives to abstract thinking gives meaning to the support while allowing the learner to think abstractly (Mastropieri, Scruggs, & Shiah, 1991). All of the components above have a reflexive relationship. They are needed to build complete understandings of mathematics. The ways of knowing or conceptual understandings, give meaning to the procedures and the concrete supports (Lampert, 1986).

Students need the conceptual structures to use the concrete supports effectively (Fuson et al., 1997), which prepares the student for abstract thinking necessary to do higher-level mathematics. The concrete supports are referents in understanding symbols associated with mathematics; in best practice they are used to make connections between concepts (Hiebert & Carpenter, 2005). When used improperly or as toys, they are not only ineffective; they trivialize mathematics and the concrete materials used. The concrete supports or manipulatives are only useful when the underlying concepts are clearly taught. Connections between concrete and computational knowledge is also important (Lampert, 1986).

In order to use physical tools effectively the student must create and manage conceptual structures. The understanding of the purpose and use of the tool can support learning, for they must “see in their minds” (Fuson et al., 1997). Students must use the context of the learning environment to understand that the tool is useful for solving mathematics problems (Hiebert et al., 1996; Hiebert & Carpenter, 2005).

Teaching students with DD mathematics concepts is a foundational support in learning mathematics at a high level. The students need to visualize and see the problem from many angles to understand completely what they are doing. Concrete supports in context are very useful in this endeavor (Baroody, 1988; Fuson et al., 1997; Hiebert et al., 1996; Hiebert & Carpenter, 2005). Students with low working memory need adaptations to learn algebra, for instance, breaking a larger problem into smaller problems (Martinez, 1998) or composing and decomposing numbers (Fuson et al., 1997). A balanced mathematics program with explicit and systematic instructional support has been shown to be effective for educating struggling learners (Baroody, 1984, 1986, 1988; Broome & Wambold, 1971; Browder et al., 2009; Joseph, 2009). It is important to developing conceptual understanding in mathematics (Fuson et al., 1997; Hiebert & Carpenter, 2005; Lampert, 1986; Wood, Cobb, & Yackel., 1990), which can then be used to solve rich mathematical problems (Miller & Mercer, 1997; Henningsen & Stein, 1997). Using the underlying components of conceptual understanding and problem solving to support each is critical in developing well-rounded mathematicians.

Peer models without disability. While many articles exclusively focus on a peer model being a peer without a disability, I found one article that focused on a peer model with DD. In Roberts (2007), an 11th grade student with Spina Bifida taught self-determination skills to another 5th grade student with the same disability. The results of this study were that the 5th grade student increased progress toward IEP goals by 75%. The significance of this study to my own is that when a peer with similar disability increases the outcomes for the student, it is a worthy vein of research to continue work in. I found other articles that focused

on video modeling of a person with a disability imitating a peer model (Ogilvie, 2011; Bellini, Akullian, & Hopf, 2007), which is similar to research where one or more peer models without disability assisted a peer with a disability (Carter, Cushing, Clark, & Kennedy, 2005).

Money habits of people with DD. Money habits of the people in the Money Club emerged as a theme after many hours analyzing taped classroom conversations and poring through the design notes forms from class instruction. It became obvious that the specific money habits of the individuals dominated any skills they may have learned in managing the money and impacted the quality of their lives. Understanding the underlying habits of the participants became a window for learning how to teach them about finance.

Gaps in the research. There are many examples of research on the learning of money skills for people with DD (Browder & Grasso, 1999; Morse, Schuster, & Sandknop; 1996; Xin, Grasso, DiPipi-Hoy, & Jitendra; LaCampagne & Cipani, 1987). Many studies focus on the independence of the individual and how money skills can be the path toward this end (Agran, Blanchard, & Wehmeyer, 2000; Zhang & Stecker, 2001). The focus and rationale for studying money skills is based upon the fact that people with DD lack the preparation in money skills necessary to live and work in the community (Brown, 2000; Patton, Cronin, & Jarrrels, 1997).

Research has been conducted within general populations, however, which may help illuminate the importance of money habits for those individuals with DD. Ravn, Schmitt-Grohe, and Uribe indicated that there is a relationship between price breaks and the development of deep habits in consumers (2006). The initial lowering of price will entice an individual to shop at a particular store for a specific item, oftentimes buying other items as

well, which results in future sales increases, spurring an increase in output for that particular item as well as others. This is why stores will offer deep discounts on a few items, hoping that you will continue to purchase everything else on your list as well.

The habits of the general population are significant drivers for a business. Consumer choice is hastened by the habits of the individual (Kim & Choi, 2007). The individual is also inclined to be interested in the difference in consumables between himself and his neighbor (Abel, 1990). The individual may work to close the perceived gap between what they think everyone else has and what they have. This race to meet the aggregate spending of the area is known by businesses and used to prey upon the consumer through ads. People with DD are not immune to the effects of media and the resultant habit formation, furthering the importance of identifying and addressing the money habits of those individuals in the Money Club.

What were obviously missing in the research on money habits are the precursors to money skills, which are the inclinations, tendencies, and forces that can be categorized broadly as influences that define and drive the money habits of the individual. If a teacher is to teach money skills, he should be aware of the habits that dominate how the money skills he is intending to teach are going to be applied by the individual in the community. I assert that habits will trump any teaching of skills, because habits are ingrained and have been developed over many years, drilled at higher repetitions and applied in real situations more than any skill course could do. At the beginning of the study, I needed to understand what habits constituted their spending first, and then develop skills to work and support them to overcome the inherent weaknesses with each money and spending habit each individual had.

Money skills is defined as the learning of functional of mathematics skills applied to the identification of monetary units and using these correctly in a store. These skills are very important and not to be minimized in this study. Many programs have taught individuals how to make change and spend their own money (Xin, et al., 2005). A concern is that the individuals may be taken advantage of by the person at the counter or worse yet walk out of the store without their change after picking up their purchase. I addressed the underlying habits and understandings of spending money and their impact on an individual's life; this has not been studied in the area of people with DD.

While technical skill is needed to purchase items at a store, understanding the concepts of spending (why, where, when and for what reason) are needed for people to spend their money well. Completing the cycle of a transaction is important; however, knowing why someone is buying an item and understanding if he is getting the best deal for that item are also of critical importance.

Life skills. Money skills are often researched under the broad construct of 'life skills'. In high schools, many people with DD will take 'life skills' classes where they learn mathematics in relation to learning about money and going out in the community and spending it appropriately. Students can be supported by their teachers, peers, and parents to learn functional daily living skills (Carothers & Taylor, 2004). Purchasing skill instruction has been found to be 'moderately effective' in one Meta analysis (Xin et al., 2005). Studies have also found that people with DD have been able to independently manage their money with programs that focus on competitive employment (Moon & Inge, 2000). What I became increasingly interested in as the study progressed was that participants in the club would

spend their own money, make change, purchase any item they desire, yet they are held hostage by their habits. I could not work on money skills without addressing the strengths and pitfalls of each person's money management habits.

Independence. In any life skills, community based instruction (CBI), or money skills and habits program, the direction and endgame of each should be to increase the independence of the individual. In the Money Club, I focused on independence through efficient use of money, so the participants could spend money on things they desired at the best prices, while thinking through each purchase and other options that may be better use of their money. Spending money wisely and efficiently is particularly important for individuals with DD who are on limited budgets, with very strict rules for how much money they can earn each month to continue to qualify for essential benefits. In order to be independent they must learn financial concepts at higher levels than persons without disabilities due to the increased restrictions and penalties of the social security system, hence, the challenge and importance of understanding the money habits of people with DD.

Conclusion. Money habits are deeply rooted in an individual and continue through future choices (Kim & Choi, 2007). These money habits are influenced with daily exposure to internet, billboard, television, and radio ads purchased by the major corporations. These ads run continuously, for the corporation knows that if they can get an individual to develop a specific consumption habit it will continue in the future, called a *deep habit* (Ravn, Schmitt-Grohe, & Uribe, 2006). Finally, the perceived difference in status of an individual may channel these habits toward overspending to rise to the level of their neighbors (Abel, 1990).

The money habits of adults with DD impact their financial stability by slowly chipping away at their money until they are in debt. While there has been much research in the area of money skills (e.g. spending, check writing), I have found no research on habits which exert a great deal of force upon and can enhance or dispel the money and life skills taught to the individual with DD. Working toward the independence of the individual with DD, the participants and I worked on the effects our personal spending habits have on our lives. Improving the spending habits of people with DD will enhance any program geared toward learning life skills, money skills, or CBI.

Scams targeting people with DD. Scams targeting the participants in the Money Club became a theme after listening to the group's side bar comments while solving problems. I intended to apply mathematics toward scam avoidance in the beginning of class, but had no idea the breadth and impact that scams had on the individuals of the club. The work on this section was inspired by my work with families of students with DD and the book "Broke USA" (Rivlin, 2010), which chronicles the lives of the 'working poor', a label for which many people with DD qualify, and how they have been scammed by local businesses. In this section, I will discuss the prevalence of scams in society, types of scams that became lesson plans in the Money Club, and impact they may have on people with DD.

Prevalence of scams. Scams have impacted people of all ages, races, ethnicities, abilities, and levels of education. They have debilitated people, families, and their ability to stay financially solvent. Scams have included: Ponzi styled 'Bernie Madoff' investment scams, work at home scams, internet phishing and mail fraud, as well as the well known "Nigerian Letter" aimed at getting people's bank numbers through offers of free money wired

to their account to help this foreign national (Robins, 2007). There are also legal activities that prey on the ‘working poor’ such as pawn shops, pay day loans, variable loans, instant tax refunds, rent to own shops, and check cashers that operate within the law (Rivlin, 2010), but outside of any definition of fair and ethical business practices. Within this multi-media assault on people’s tendency to earn more money or obtain items not available to them, these businesses prey on the “most vulnerable” (Lewis, 2008) and this can often be persons with DD, who get by on minimum wage and are trapped by a low savings ceiling that encourages them to take on bad loans for items above the \$2,000 threshold.

Types of scams. United States citizens lose close to \$250,000,000 each year in overseas scams (Bernier-Toth, 2011). Americans are not the only people vulnerable to scams; in Australia, 17,000 citizens were taken for 32.9 million dollars in scams in 2008 alone (Lewis, 2008). People with disabilities are not only targets of scams, but also used as bait to scam good hearted people into donating money to illegitimate and concocted “disability groups” (Lanford & Lanford, N.D.). In poor neighborhoods where many adults with DD live, pawnshops and payday loans set up shop to take their neighbors for hundreds of thousands of dollars in fees.

One of the most common overseas scams is the ‘419’ or ‘Advance Fee Fraud’, which is commonly known as the Nigerian Letter. The Nigerian Letter is sent through the traditional mail or through email and asks for a little money upfront (fees, postage, etc.) to get a lot more money later if you help them. They will ask for Social Security numbers and even bank account numbers to speed the transactions up. These scams are packaged as legitimate contracts, credits, inheritance, job, lottery winnings, immigration papers, marriage offers,

religious donations (Sowunmi, Adesola, & Salako, 2009). They often sound like distress signals and requests to help them get their money out of a ‘corrupt and dangerous’ government, Nigeria qualifies due to the “strongly rooted” corruption from 29 years of military rule (Sowunmi, Adesola, & Salako, 2009). These scams are lies in between many truths – they work because it is very believable and the scammers know it.

Specifically, the deaf community is targeted in half of the 14,000 people taken advantage of in high return investment scams. People with challenging mobility issues, which include many elderly, and those with DD are targeted in ‘work from home’ as well as quick cheap sales of medical equipment (special shoes, wheelchairs) for ‘cash up front’ and never seen again (Lanford & Lanford, N.D.). These and other types of scams can financially ruin any person, but for those in what Rivlin (2010) places in the category of ‘The Working Poor’, which includes many of those with DD, it can take many years, sometimes decades to recover.

Spear-phishing. One example of a high level, intricate scam that targets both people with DD and the most highly educated individuals in society, working unwittingly in tandem, to scam people out of close to 100 million dollars, known as a ‘Spear-Phishing e-mail scam’ (Internet Crime Complaint Center (IC3), 2009). The process for a successful ‘Spear Phishing email scam are (a) The scammer initially targets a high-level business executive who has authority to initiate money transfers, at a bank or business. (b) The business executive will receive an email with an embedded infected file, which contains a key logger, which can harvest codes and passwords to financial accounts. (c) The scammer will have on hand several people who they earlier targeted with a separate ‘make full time wages from home in

half the time' campaigns. They will ask these stay at home workers, which include people with DD, to open their bank accounts to the company so they can 'get paid fast'. (d) Once the scammer harvests the passwords to both the executives' and stay at home workers' accounts they begin to transfer large sums of money to the stay at home workers account. (e) The stay at home worker is directed to forward most of the money to an overseas account and keep the rest, often times losing all the money (Internet Crime Complaint Center (IC3), 2009).

Pawn shops and payday loans. Many pawnshops and payday loans set up shop like phishing scams – in low-income neighborhoods where they are sure to find desperate people wanting to trade their valuables for needed money fast (Rivlin, 2010). Many of the members of the Money Club had done business at some of these places, losing 90% of paid value of the items they pawned for loans or straight cash. Owners of these establishments are well known to associate with criminals, taking stolen items from community members, 'fencing' them and reselling them back to the same people from whom they stole.

For example, the owners of one pawn shop in Seattle, WA pleaded guilty to paying for stolen items (Singer, 2008). They recruited "thieves and drug addicts" to go to area businesses and steal high priced items for a payment of 10% of value, which included Armani Suits, Kitchen Aid mixers, and crystal vases. During the 2004 fiscal year "\$110,000 worth of stolen items were sold on eBay" (Singer, 2008).

Another example of the dangers of going into the Pawnshops occurred at E-Z Pawn in San Benito, TX where 83 customers' identities were stolen. The pawnshop set up 'dummy' loan accounts using their identities and took over \$100,000. These are individual examples of

a larger countrywide pawn shop/payday loan industry that has become a multi-billion dollar industry; it is estimated that 14 million out of 120 million US households in 2008 visited a payday loan business, borrowing a total of 40 billion dollars (Rivlin, 2010). It is frightening to consider the standard yearly interest rates, from Cash America, which are averaged at 210 percent.

Impacts upon people with DD. The impacts of scams on those with DD are astounding. The Better Business Bureau (BBB) states that stay-at-home parents and people with disabilities are targets for ‘work at home’ scams where they will ask individuals to pay fees for transfers and the cost of equipment to assemble items, often times rejecting the piecemeal work and taking all the fees from the individual (Hart, 2010). They prey on the mental attitudes of people with disabilities who have lived through mistreatment by community members. They already feel that what they do is not of high quality so when their piece is rejected they just write it off as yet another failure. They will oftentimes not turn in these piecemeal scams to authorities to avoid further insult.

In an agency brief for the state of New York, called ‘project 2015’ the analysis concluded that the agencies need to prepare for upcoming safety and security issues concerning scams on the elderly and those with disabilities (Prosper, 2011). The author specified that ‘financial, internet, and predatory business practices” (p.5) and “telemarketing, identity theft, and personal crimes” (p.13) were of concern for these populations (Prosper, 2011). The scams are already operating in the disabilities community; it is time to arm the people with skills and understandings to take on these criminals.

Conclusion. Scams are widespread and pervasive coming at people with DD online and in the mail (the Nigerian Letter), in advertising (Work from Home, piecemeal work), and in the form of pawn shops/payday loans (low value for pawns compounded by high interest on loans from pawned items). The scam artists are knowledgeable about their targets (Lewis, 2008) and know how to get them to hand over social security and bank routing numbers. They prey on low self-esteem and self-worth that many people of all abilities suffer from to take them for all they have. The understanding and teaching of skills to people with DD in the form of programs like the Money Club are vital to the avoidance of scams that continue to plague the community.

Self-advocacy, self-determination, and empowerment in people with DD. Self-advocacy, self-determination, and empowerment refer to the belief that we all can make choices and become more involved in the shaping of our lives. The terms also reflect a skill we can learn and dispositional characteristics that are with us through different situations. These terms are important when persons, regardless of ability, take on a task that is challenging. They need to believe that they can do it and have the skills to garner support as well. The result of self-advocacy, self-determination and empowerment is a better life. I believe that a better life can include understanding the world around us more fully, which can also include a solid mastery of mathematics and its applications.

Self-determination is “acting as a causal agent without undue interference or influence.” (Wehmeyer, 2005a, p.178). Self-advocacy is the act of standing up for yourself (Wehmeyer, Bersani, & Gagne, 2000). Empowerment means using one’s voice and personal control over one’s own destiny (Fiedler & Clark, 2009). Regular practice of self-advocacy

leads to the disposition of self-determination whose goal is empowerment of the individual with a disability.

People with DD can use mathematics as a medium for learning self-advocacy skills and understandings on the path to a self-determined life. The resulting empowerment, buoyed by mathematics concepts and skills can be a stepping-stone into a more meaningful career, better pay, and a better understanding of the way the world works. Mathematics is generally taught only as a low functioning skill (Zucker, 1995) that can be later used in a low paying job. The dispositions and beliefs necessary for learning mathematics (Cobb, 1985; Cobb et al., 1991; Miller & Mercer, 1997) run parallel to those same efforts and experiences on the road to self-determination.

Self-advocacy. Self-advocacy is a component of self-determination (Algozzine, Browder, Karyonen, Test, & Wood, 2001; Pennell, 2001). It is the act of standing up for yourself (Wehmeyer, Bersani, & Gagne, 2000). Self-advocacy is also a civil rights movement for individuals with disabilities (Test, Fowler, Wood, Brewer, & Eddy, 2005). The foundation of self-advocacy is the knowledge of self and their individuals rights (Pennell, 2001). When you stand up for yourself you are on the road toward self-determination. People with self-advocacy skills are able to act as causal agents in their lives. The importance for self-determination, especially knowledge of rights, is crucial for individuals with severe disabilities, who in one study would not express these rights when asked (Blanck, 1994).

Teaching self-advocacy to individuals with disabilities at an early age is crucial (Blank, 1994; Test et al., 2005; Wehmeyer & Palmer, 2000). Often, individuals with

disabilities are taught self-advocacy skills in high school or in post-secondary classes. These skills can be taught earlier using deliberate instruction to insure effectiveness (Test et al., 2005; Wehmeyer & Palmer, 2000). From 1990 to 1993, the number of persons with disabilities participating in self-advocacy activities doubled from 15% to 32% (Blanck, 1994).

For self-advocacy to become successful, professionals must shift their focus from advisor to consultant when helping others become self-advocates (Pennell, 2001). The advocate and his or her wishes and needs should be central to any effort to assist. Even those with the best of intentions can work counter to the goals of the individuals if they are not acting in concert with the individual with a disability. Professionals are not martyrs, as some would view them, for they receive a lot in return for helping others become self-advocates (Fiedler & Clark, 2009).

Self-determination. Self-determination is “acting as a causal agent without undue interference or influence” (Wehmeyer, 2005a, p.178). This definition does not imply that individuals are working independently or in complete control of their environment; they are a part of the construction of the life they want with support (Wehmeyer, 2005b, p.116). This help comes in the form of others who facilitate, empower and strengthen the individual toward future independence. (Price, Wolensky, & Mulligan, 2002). It can also be seen as, “the determination of one’s own fate without compulsion.” (Wehmeyer et al., 2000).

Self-determination is the combined, end product of the normalization and deinstitutionalization movements that occurred in the 1970s in regards to people with severe disabilities (Algozzine et al., 2001) which is rooted in the belief that disability is part of being

human (Wehmeyer et al., 2000). All people have the right to a self-determined life. Some have argued that self-determination might be rooted in the cultural values of “upper middle class Anglo professionals and families” (Turnbull & Turnbull, 1996, p.199), although one could argue that many minority cultures around the world participate in similarly self-determined actions as those mentioned in this research and it is not specific to any culture or their values. Self-determination is a ‘dispositional characteristic’ of an individual (Wehmeyer, 2005), of which all people are capable.

There are four principals of self-determination: Freedom, authority, support and responsibility (Pennell, 2001). The individual has freedom to choose what is best and the authority to make those choices in one’s life. The individual actively accesses the support of those around them, including others with disabilities, government agencies, guardians and people without disabilities. The responsibility is on the individual to do what is best for him/herself and make choices that are goal oriented.

Further, choice and the ability to be heard is the energy that drives self-determination (Price et al., 2002). This may partially explain why professionals adjust the level of importance they place on self-determination for individuals with severe disabilities (Wehmeyer, 2005b) – the professional may not understand what the person may want or need or believe that an individual needs to be independent to have self-determination. Regardless, all individuals with disabilities are protected by their rights, which include services and supports, to live a productive and meaningful life.

Empowerment. Empowerment means using one’s voice and exerting more control over one’s own destinies (Fiedler & Clark, 2009). Empowerment is a component of what

teachers and the schools they teach in promote, while forming the society we live in. The cycle of learning leads to empowerment of the individual, through choice making, risk taking, and learning (Luckasson, 2006).

Empowerment includes the opportunity to learn from the choices we make and continue to work. Oftentimes people with disabilities are taught in a ‘flow through model’ for acquiring skills, where they are placed in training until they master the skill, never moving on to the real job (Wehmeyer et al., 2000). Differently, community based learning, where the individual can job shadow, learning skills while on the job which are later reinforced in the classroom, has been shown to be effective (Price et al., 2002). The Money Club embraces the latter model.

Empowerment in mathematics also includes choice in the ways a person thinks, strategizes and solves problems and the opportunities to learn from mistakes. People with DD as well as other struggling learners get placed in ‘flow through models’ of mathematics instruction, also known as remedial mathematics, where the persons never move on to the next problem without mastering the skill of the one they are on, resulting in many people graduating from high school still learning to multiply and divide.

Self-determined learners are able to garner support, think through decisions, take risks in learning, as well as be responsible for the choices they make. When people face problems and experience difficulties in an honest manner, they are accepting the opportunity for brain re-organization (Cobb et al., 1991) as well as completing the learning cycle toward empowerment (Luckasson, 2006). If mathematics educators can find ways for people with DD to access rich mathematical understandings and attach skills to those networks, they will

be teaching self-advocating and self-determined dispositions by encouraging individuals to participate actively in the cycle of empowerment.

“Self determination is acting as the causal agent in your life” (Wehmeyer, 2005a, p.178). Self-advocates can stand up for themselves (Wehmeyer, et al., 2000). Empowerment comes from within and is a source and cycle of re-generation (Luckasson, 2006, Fiedler & Clark, 2009). Through the practice as an advocate, one can develop the habits/dispositions of self-determination. Teachers who nurture as well as push people with DD to hone their talents will become a primary source from which the above mentioned items spring.

Conclusion. In summary, the theoretical frameworks for studying the experiences of individuals with DD and teacher in a money club focused on work in cognitive science, Deweyan pragmatism, and flow. Within the scope of cognitive science, I specifically applied to concepts of bridging and shaping the mathematical knowledge of those with DD by using projects and lessons that mined for the emotional reaction and involvement. Dewey and his work with cooperative community learning and learning through direct experience with our surroundings are also explored. Flow, or the path toward optimal experience can be attained through highly engaging activities that individuals care about and have the opportunity to test themselves a little outside of their comfort zone.

Mathematical supports for learning are of paramount importance to learning mathematics and finance at high levels. The use of conceptual understanding as a cognitive support for learning helps connect the concrete manipulative supports to the abstract thinking necessary to learn algebra. Through the use of peer tutors, composing and decomposing

numbers, applied mathematics, and invented strategies among others people with DD can learn basic algebra in a money club.

Through the implementation of an empowering curriculum, teaching self-advocacy, self-determination, money habits, and how to avoid scams an individual with DD can become more independent. The program used in the Money Club encouraged individuals to work slightly past their present capacity, to take risks in a supportive environment, spurring growth. They can avoid or recover from financial pitfalls and avoid the scams that can attack us in a multi-leveled assault on our financial stability.

The employment of design experiment methodology, mined the experiences of teacher and self in the Money Club through a structured and rigorous plan. The daily classroom analysis impacted classroom design and improved my understanding of what supports worked with each individual participant. The conjectures of both students and myself coupled with systematic documentation, detailed the changes in experiences of the participants and myself. Likewise, the formative evaluation and data corpus pieces triangulated data from multiple sources to develop the themes, which emerged throughout the Money Club.

Chapter 3: Methods

Introduction

In this chapter, I will explain my use of a design experiment as the method for my emergent inquiry. I will explain all the procedures of the experiment, participants and protections, validity, credibility, rigor, use of interviews, and multiple forms of data collection. The purpose of the study was to investigate the experiences of young adults with DD and me, their teacher researcher, about mathematics, finance, and self within a 6-week program of instruction titled the Money Club. This includes how adults with DD reason, apply, perceive, and solve applied mathematics problems in finance. I wanted to learn in particular: 1) What specific experiences affected the beliefs, perceptions, and classroom actions that emerged for participants and their teacher during the Money Club. More specifically: a) What themes emerged within people with DD as participants? b) How did the experiences – the beliefs, perceptions, and classroom actions impact instruction and planning from the teacher/researcher? c) How are spending habits and financial abuse by others addressed by higher level mathematics for people with DD? and d) What specific supports within mathematics instruction were used to deliver the information? For my data collection I primarily used 5 streams of data (interviews, design notes forms, lesson plans, taped class sessions, and coding sheets) to develop themes and answer the research questions.

A design experiment is a qualitative form of inquiry rooted in developmental research, which emerged from the daily practice of teachers from the Netherlands (Gravemeijer, 1994). A design experiment is comprised of two interwoven components: classroom analysis and instructional design (Stephan & Cobb, 2003). The teacher will use

multiple data sources, becoming discernible text to be later analyzed in the coding sheets (Cobb & Whitenack, 1996). These multiple data sources are used to structurally support the assertions, conjectures, and other findings of the study (Edelson, 2002). The data are then analyzed at multiple points throughout a given study in order to reach a grounded understanding of the classroom experience and provide *construct validity* (Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003; Cronbach & Meehl, 1955).

This form of research closely follows best practice for teachers, for it is both flexible and well documented. The theoretical underpinnings of design experiments are grounded theory, symbolic interactionism, and emergent perspective. The purposes and outcomes of a design experiment are to develop and simultaneously test theory or to “place theory in harm’s way” (Cobb et al., 2003). In this study, the thorough testing of my conjectures utilizing the five streams of data in retrospective analysis (interviews, design notes forms, lesson plans, taped class sessions, and coding sheets) resulted in four themes (problem solving, money habits, scams, and empowerment). In the following paragraphs, I will display and explain the components of this research used in achieving this end.

Theoretical Frameworks of Design Experiment

I chose a design experiment as the method for researching the experiences of adults with DD and a teacher of mathematics in the Money Club. This method has the components necessary for displaying the experiences of myself as well as those of the participants. A design experiment utilizes theoretical components from grounded theory, symbolic interactionism, emergent perspective, and developmental research. In this section, I explain

the history, the interwoven components and frameworks, as well as the applications of a design experiment. I will begin with the frameworks.

Grounded theory. *Grounded theory* is a qualitative method most aligned with positivism. Grounded theory methods require the researcher to “conceptualize what emerges from data” (Glaser, 2004). From this viewpoint, all things that occur can be coded as data and we are only limited by our ability to catch and understand the data in front of us. This methodology contends that there is an objective existence of a reality and we just need to find it. Glaser (2002) was especially clear in stating that when conducting grounded theory research the study does not tell a story and that ‘data do not lie’, meaning that within this method data are discovered and stated as is without embellishment. (Glaser, 2002, 2004).

Within this methodology, truth should emerge from the data, the methods should be explicit, decorative language is unnecessary, and facts are of paramount importance. Clear descriptions of instrumentation and setting and procedures should be explicit, without any constructed meanings, allowing the data to stand-alone. The potential for generalizability will define a grounded theory study (Glaser, 2002, 2004). Components of grounded theory, which will be specified later in this chapter, will be used to view the data.

Objectivist grounded theory. According to Glaser (2002, 2004), constructivist grounded theory does not exist. Data has a single meaning, which can be the basis for building theory. It is a scientific process for finding a single reality from each data point. Researchers are to reflect directly upon the data until truth emerges from it. The researcher uses interviews, which incorporate participant viewpoints and accounts. The singular truth is there, the researcher just needs to find it (Glaser, 2002).

Objectivist grounded theory requires that in a search through the data, we are discovering something that was already there. We are discovering something new to us, although the data existed before we found it (Charmaz, 2003). Problems in objectivist grounded theory include: singular meanings, researcher is separate from the research, researcher is the authority on the research and the final research is an exact rendering of the experience (Charmaz, 2003, p.313). Multiple meanings and meanings in context are not used to view the problem.

Constructivist grounded theory. According to Charmaz (2000, 2003) there is room within grounded theory to include multiple meanings, which can create multiple theories from a single data point. She argued that objectivist grounded theory is too constrictive for understanding an individual's experience. People are continually reconstructing the initial experience and at any time and place, accounts of an event will be different. The researcher and participant are both affected by each other and many realities exist (Charmaz, 2003).

The interactionist basis for constructivist grounded theory (Charmaz, 2003) is later applied to a design experiment (Stephan & Cobb, 2003). Constructivist grounded theory was used to view and understand how the teacher and students co-constructed reality (e.g., what is teaching and what is learning in the Money Club) and how the reality of the Money Club affects and changes the participants' perspectives on teaching and learning mathematics. The multiple realities that may exist are reported before, during, and after the study. These conjectures were grounded in the data before, during and after each class.

Symbolic interactionism. *Symbolic interactionism*, a theory coined by Blumer after extensive study of George Herbert Mead's work, viewed learning as a shared experience.

Both the individual and researcher, within the interaction, create meaning and will affect each other (Blumer, 1980; Bauersfeld, 1992). Symbolic interactionism views learning as a social accomplishment (Bauersfeld, 1980). The two leaving an interaction are changed individuals.

In this study, aspects of symbolic interactionism are evident in a design experiment. Criteria for studying this social behavior include the following: behavior must be directly observed, be simple and brief, be capable of easy detection by the researcher, and can be counted in units for later analysis (Blumer, 1980, p. 418). The units of measure in this study are the changes within the individual through the experiences of the participants as well as my own throughout the study. Using coding methods and tape dissection, themes emerge. The criteria emerge within the retrospective analysis of the *data corpus* after the intervention of a design experiment.

Emergent perspective. Cobb and Yackel (1996) merged components of *psychological constructivism* focused on the individual and Blumer's symbolic interactionism and welded them into an *emergent perspective*. They also extended *developmental research* (Gravemeijer, 1994), modeled after educational practices in the Netherlands, which is a backwards planned course of continued adjustment toward an educational goal (Gravemeijer, 1994). Cobb and Yackel's (1996) new emergent perspective allows flexibility in adjusting one's teaching with the structure and accountability of open reporting and detailed accounts of shifts in theory and design.

The emergent perspective is "conducting psychological research in the background of interactionist research" (Cobb & Yackel, 1996, p.188). Emergent perspective is focused on mathematical practices and communities of learning (Cobb & Yackel, 1996). The researcher

scrutinizes the social norms within the classroom, which are viewed in individual as well as collective terms. Re-negotiating these norms by both the students and teachers impact overall social norms (Cobb, Yackel, & Wood, 1989). The emergent perspective takes on the dichotomy of individual and social learning and welds the two together (Stephan & Cobb, 2003).

Developmental research. Developmental research is the pre-cursor and had the most influence on the creation of the design experiment. It integrates “research and instructional design” (Gravemeijer, 1994, p.443). Developmental research is focused on the learning processes and adjustments both teacher and student engage in during instruction. Developmental research generates theory through practice with detailed documentation of the adjustments the teacher makes to impact instruction (Gravemeijer, 1994, p.448).

Gravemeijer (1994) distinguished developmental research from teacher development. Teacher development’s sole purpose is to improve the practices of a teacher, while developmental research generates new theory for the entire research community to review. The cycle of developmental research is “Research develops theory which informs and drives further research which develops new or expanded theory” (Gravemeijer, 1994, p.456).

What is a design experiment? A design experiment emanated from multiple theoretical frameworks including grounded theory, symbolic interactionism, and the emergent perspective. The design experiment emerged directly from developmental research and has shared components including the focus on learning processes of students and the arc of curriculum development of the teacher. The purpose is to eventually share the results of the

design with teachers in the field and not just to improve the teaching of the individual teacher.

Purposes. A design experiment is comprised of two interwoven components: Classroom analysis and instructional design. The two components are used in both real time and as post study examination of the research data. A design experiment allows the researcher to study individual and group actions within classroom practice throughout the continuum of a study (Stephan & Cobb, 2003). A design experiment is an iterative process, grounded in theory, and aimed to understand and improve how people are educated (diSessa & Cobb, 2004; Edelson, 2002). The design uses data, turns it into text, and analyzes it for meaning (Stephan & Cobb, 2003). The analysis generates theory, which structures and sets the stage for further study (diSessa & Cobb, 2004). The decisions the researcher makes are grounded in the theoretical framework of a design experiment, specifically the design notes form. The design notes form is a detailed account of the actions and consequences of the choices made throughout the experiment (Edelson, 2002). The process of a design experiment is continual, utilizing well-documented adjustments in thinking and acting.

Operational Definitions for this Study

Four terms necessary in understanding the methods of this study will be operationally defined here. Other definitions not specific to the methods of this study, but rather important to the theoretical underpinnings and research supporting this study are found in Chapter 2 of this dissertation.

Engagement of the participants in this study is defined as meaningful involvement in classroom actions within curriculum. This could include acting as a peer mentor/tutor,

actively questioning the teacher or peer, sticking with a mathematics problem until it is completed, and participation in a large or small group activity.

Beliefs of the participants including myself are interwoven directly from three research points of view and are designed as such. They consist of our thought processes which guide our day to day decision making and sustained reflection (Ernest, 1989) found in the design notes form. These thought processes are also stable constructs that have changed little in an individual's life (Klosterman, Raymond, & Emeneker, 1996). Finally, the four domain explanation of mathematics specific definitions is crucial in defining beliefs in this research. Mathematics beliefs are comprised of four domains: Beliefs about mathematics, beliefs about self, beliefs about teaching, and beliefs about social context (McLeod, 1992).

Specialized supports in this study are defined as teacher driven, peer driven, conceptual, visual, concrete, and auditory resources and strategies that reinforce and strengthen the understanding and skills in mathematics.

Accommodations for this study are defined as an alternative way for the individual with DD to show understanding, skill, and competence within each class. The accommodation in no way lowers the level of rigor in learning, it just provides a different path toward the same goal.

In many occurrences, as seen in Appendix D, the support envelops the accommodation. For example in lesson plan 4 (Appendix D), the academic support of bridging their past to aid their present learning is also an accommodation, for it allows an alternative path toward demonstrating competence.

Standards are formal expectations for academic performance. The guiding academic standards for this study were taken directly from the New Mexico High School Mathematics Standards in Algebra (New Mexico Public Education Department, 2008). I did not choose any standards from the Expanded Grade Band and Expectations (EGBE), which are traditionally used for students with DD because I wanted the participants to be exposed to the standards that the general population is exposed to. I made this decision knowing that it might not work and that I might have to switch gears midway through the study. Each lesson on applied algebra and finance was tied directly to these standards and used as my navigator for developing lesson plans. No textbook was used at any time during this study, nor was any lesson borrowed in any way from a published lesson idea. All lesson plans emerged from both the participants' interests as taken the first day of class as well as my experienced conjectures on what was developmentally appropriate learning material taken from my prior years as a teacher.

Participants and Units of Analysis

Focus of attention and purpose of study. The focus of attention was on the experiences of the participants and teacher/researcher. Using constant comparison method, I documented the changes in our experiences over time. The design notes form allowed me a flexible, yet methodical structure for making daily conjectures which influenced the lesson plans and supports for the participants. The design notes form forced me to explain what, when, and why I chose to teach certain concepts and skills to the participants.

The purpose of this study was to identify and explore the experiences of the participants who have DD in regards to mathematics and self. It was also an investigation

into my own experiences, which have impacted my choice of theoretical framework, planning and curriculum development, instructional supports, as well as how I use mathematics.

Participants. With the help of two people who work at the Metropolitan League of Self-determined Individuals, I recruited and included all people who are involved with the league. I asked for and was granted permission to run the Money Club from the League in February of 2010. I then submitted my research proposal to the University of New Mexico Institutional Review Board (IRB) for permission to conduct research in the spring of 2010 and received permission in June of 2010. The people who go to the league have a range of disabilities, which according to the center include: Intellectual disability, autism, cerebral palsy, and TBI. Six men and four women, for a total of 10, participated with higher than 80% attendance. My criteria for inclusion were that the individual participating must be at least 18 years of age, provided consent from a guardian or the individual and assent from the individual, and has DD. My criteria for exclusion were a person younger than 18 years of age, without DD, or no form of consent from guardian and assent from the individual.

Recruiting. Recruiting was in the form of a flyer that was disseminated from the Metropolitan League of Self-determined Individuals. I met with the individual and guardian if applicable at the league to clearly review what the study entailed and answer any questions. I ensured that the participants were clearly informed and understood exactly what was to be included in the study. I also made it clear that the individual could still be a member of the club and not participate in the study. There were many individuals who were not participants in the study who stopped by and attended classes. Due to the open, ‘drop in club’ environment of the league this was very common. I included everyone who signed the

consent and/or assent forms who met the above conditions, in the initial interview. Based on attendance and attrition, I included in the post interview those who attended the classes 70% of the time. I did not include any post interviews of those who did not make the 70% attendance threshold.

Instrumentation and Data Collection

Interviews within a design experiment. Interviews were used in my research to understand the many realities or ways the participants viewed the world both before and after participation the Money Club. Interviews are considered components of a design experiment and used as one element of the data corpus (Cobb et al., 2003, p.12). These interviews were taped, transcribed, and analyzed for themes within the study. I set up between three and four microcassette tape recorders, one at each table, depending on daily attendance, which at one point reached 16. I listened to the tapes and took notes on the action within the classroom. I then developed coding sheets to capture the themes of the Money Club. I collapsed certain codes, combined others and found that my fourth draft of a coding sheet fit the needs of the study. The class sessions and interviews were analyzed using coding sheets, which organized similarities and differences in responses. The structure of the interview ranged from completely structured to open ended (Creswell, 1998). I made sure that I followed the characteristics of Creswell's (1998) high standard interviews: credible interview assures confidentiality, while a trustworthy interview is one that develops rapport between the participant and interviewer. Quality of the interview can be judged on the listening skills and open-ended nature of the questions asked which lead to richer responses (Creswell, 1998; Erickson, 1984; Looney, 2008; Marecek, 2007; Miller, Hengst, & Wang, 2007).

Prior to conducting the interview, the researcher needs to make his reasons for the interview and study explicit to all participants (LeCompte, 1987). I made sure to explain clearly why I wanted to interview them. I attempted purposeful sampling, which specifies who will be sampled and why, which are not randomized (Creswell, 1998). I employed open-ended interview questions because they are preferred because of their ability to glean unexpected information and new understandings (Creswell, 1998; Erickson, 1984; Looney, 2008; Marecek, 2007; Miller et al., 2007). I interviewed the participants of the Money Club on their beliefs about mathematics and about self. I also engaged in self-interviews and used the design notes form to chronicle my experiences through conjectures and the changes I made to curriculum as the study unfolded.

When engaging in these open-ended interviews in the Money Club, I had to think on my feet and adapt to the interview, for it completely changed the context of the interview when the participant shared unexpected things, as found in Marecek (2007). I had to develop the ability to make sense of many responses that could be perceived as ‘outrageous’ behavior of the participant (Erickson, 1984) and think clearly and instantly to verbalize an appropriate follow up question. I did not at any time, make the statements of the participant more coherent than they are stated; for the confusions of the participant added depth to the interview, and detail to the portrait, which I would have never known (Miller et al., 2007). Interviewing people with DD can be a challenging undertaking due to sometimes limited understanding of the questions. I also perceived certain answers to be a desire to please the interviewer. I had to work around both these tendencies by asking many secondary and tertiary probing questions to try to get at the truth.

Good interviewers do not offer advice or ask leading questions (Creswell, 1998). Interviewing is a skill and must be well thought out prior to the undertaking and practiced to become proficient (Janesick, 1983). Interviewers observe and draw conclusions (Spradley, 1990) based on detailed records (Erickson, 1984; Miller et al., 2007). Researchers describe and reflect on the participant and his or her changing relationship to his or her new surroundings and people (Creswell, 1998; Erickson, 1984; Miller et al.). According to Spradley (1990), a challenge to American researchers is their inability to listen, for they habitually observe and then draw their own conclusions about a culture, losing the opportunity to learn another explanation of reality. I felt awkward oftentimes during the interviews, stumbled, stuttered, and said ‘uhm’ an awful lot, sometimes confusing my participant, as documented on the transcribed notes of the interviews. The questions or prompts can be seen in Appendices A and B.

The design notes form. I used the design notes form (Appendix C) to document the daily choices, understandings and action within the classroom and how I adapted curriculum to meet the needs of the members learning in the Money Club. I also used it as a measuring stick to see the growth of everyone including me as his or her teacher.

I wrote each day Monday through Friday. On Monday, I wrote down ideas that I had over the weekend, organized notes from the week before and made the outline of a lesson plan. Tuesdays and Thursdays, I finalized the lesson plan - filled in the supports needed to teach the lesson, organized the props and manipulatives necessary to teaching the concepts before class at 3pm. Wednesdays and Fridays I wrote, based on the design notes form and the recordings of the Money Club classes, about my own perceptions of the learning, contexts

from which the learning took place grounded in the actions of the class from warm-up problem solving to group interactions. What was written on Friday would wrap around to the new lesson plan outline on Monday.

Coding for dispositions. I used a coding sheet with 6 categories while listening to the tapes of both interviews and class sessions to observe the dispositions of the members of the group: Advocate, Victim, Self-determined, Passive, Positive, Negative and Aggressive. I developed the categories after listening to the tapes once and saw a connection that I wanted to test out in further codings to see if the dispositions of the participants influenced participation in the Money Club as seen in Chapter 4 and Appendix E. I operationally defined an Advocate as one who looked out for others and viewed themselves as givers and protectors of other people within the group or at the league. Victims viewed themselves as fragile, taken advantage of and often unable to make meaningful changes in the world; they believed bad things happen to them all the time. The self-determined individuals viewed themselves as the generators of their life; able to do what they believe is best for them. Passive persons let the world come to them and did not take risks or take charge of groups or their life. Positive persons saw a silver lining in most everything and look for the best in themselves and others. Negative persons saw the world as a bad place and around every corner there is someone who will be there to take advantage. Aggressive individuals took charge of situations in angry and negative ways; they may at one time have been victims and use the aggression to distance others from them to stay safe. Many victims as well as aggressors were also negative and many advocates and self-determined individuals were also positive.

Validity and Reliability

Validity. I chose to use qualitative research because it has strong ecological validity, accessing the human experience as it happens (Camic, Rhodes, & Yardley, 2007), which is needed for high quality research (Bronfenbrenner, 1976). Qualitative research generates hypotheses through exploration and discovery of topics previously not researched (Ambert, Adler, Adler, & Detzner, 1995; Camic et al., 2007; Greenlaugh & Taylor, 1997). It can also be validated by conducting “unimpaired, well grounded, justified, and strong research” as all research is judged; credibility comes from knowing what is ‘not obvious’ (Eisner, 2003). Qualitative research should allow the reader to “feel that they are there” (Creswell, 1998). The qualitative research method I chose was a design experiment, due to its ability to capture classroom experience and generate improved classroom instruction and to develop a working theory.

Construct validity. Design experiments are primarily interested in developing construct validity, used in social research methods, in order to generalize findings. The multiple data sources and perspectives are analyzed within the constant comparison method allowing for a higher degree of inference making within a studies theoretical development. Construct validity looks at the quality of the supports within the assertions on qualities or attributes that do not have developed measurement devices (Cronbach & Meehl, 1955). The researcher must create and develop multiple instruments for catching data that can be later analyzed (Cobb, et al., 2003). The appropriateness and number of data sources grounds the inferences and thus increases the experiment’s construct validity.

Reliability: Constant comparison method. A component of grounded theory, the *constant comparison method*, is used in a design experiment. A design experiment utilizes the constant comparison method, which takes data and analyzes the text to develop meaning (Stephan & Cobb, 2003, p.37). This data as text (Cobb & Whitenack, 1996) for the mathematical researcher can be organized into *initial conjectures* and *mathematical practices*. Upon completion of the study, the researcher returns to pore over the data (initial conjectures and mathematical practices) and retrospectively analyzes both the many conjectures (hypotheses) made by the researcher throughout the experiment as well as the observed practices within the classroom (Cobb et al., 2003). In this study the data are: pre and post interviews, design notes form, lesson plans, taped class sessions, and coding sheets.

Constant comparison method is a way for researchers to make conclusions about the data in front of them. Researchers collect data, look for patterns within the large data set and begin to set up temporary categories to focus on. Researchers then look for relationships within and between categories. Finally, they begin to code and write about the data. It is a process of whittling down a large data set into a manageable product. As a component of grounded theory, reality is knowable and truth emerges from the data. The constant comparison method is that reliable path toward reality (Glaser & Strauss, 1967). As researchers, we need to objectively look at and study the data in front of us and report back to the research community our findings so that others can conduct investigations into what we have done. The inherent reliability in constant comparison method allows the researcher to replicate findings across studies.

Reciprocity. Reciprocity, or the responsibility for the researcher to give back to the community he is studying, is a core component of ethnography (Cazden, 1983; Creswell, 1998). Many marginalized groups are used to being watched and do not trust outsiders. Giving back is an ethical responsibility of the researcher. In this study, I hoped to give back to the advocates a skill that can increase their future independence while protecting them at the same time. Snacks and healthy beverages were also provided during the 2-hour meetings.

Procedures and Data Analysis Plan

Classroom analysis (initial conjectures). In the first phase of a design experiment study, the teacher formalizes his initial conjectures, which are informed by prior research (diSessa & Cobb, 2004). The teacher discusses publicly his goals for the study: What will be learned, what he is teaching and why he chose to teach it. He makes formal hypotheses on the proposed teaching and learning of the classroom, which will change as the study unfolds (Edelson, 2002). This form of study, while highly structured, has been seen as both demanding and intricate. It has been compared to “building the plane while flying it” (diSessa & Cobb, 2004).

Research driven. The form that holds the initial research, analysis, and conjectures together is the prior research and theoretical framework of the researcher (Edelson, 2002). As the study develops, *ontological innovations* or constant theory building and shifts in viewpoints for studying the classroom begin to emerge (Cobb & Whitenack, 1996; diSessa & Cobb, 2004, Gravemeijer, 1994). This component is directly tied to Glaser and Strauss’ (1967) work on grounded theory, from which a design experiment borrows components, and

claims that theory development should occur alongside the collection of data and its subsequent analysis (Stephan & Cobb, 2003).

Systematic documentation. The systematic documentation in a design experiment is used to chart the course of the curricular choices of the teacher for both ongoing and post study analysis. The researcher is mapping each choice and its consequence on the community of learners within the design notes form and lesson plans (Edelson, 2002). The documentation is a log of testing and revising that mirrors the ways many teachers improve their skills throughout their careers. It is a series of learning cycles that becomes part of the data corpus to be retrospectively analyzed later within the context of a completed study.

Data collection and analysis. Before the first class of the Money Club, after all consent and assent were obtained and the forms signed, I interviewed each participant (see appendix A) as well as logged my initial conjectures in regards to my beliefs using a design notes form (see appendix C). This was the base and starting point for later analysis building the data corpus or second analysis as explained in the literature review earlier.

Over the next 6 weeks, I collected audio data from the each class, which also fed the data corpus increasing the construct validity of the experiment. Directly after each class, I reflected on the experiences of the classroom and my own, using the design notes form, as well as listened to the taped classes to verify classroom actions. The design notes form charted my experiences as well as continually shaped curriculum, supports, and reasons for all activities in the classroom. The daily reflection in the design notes form allowed me to create the supports necessary to learning and test this theoretical support each day in class;

adjusting them each evening. The constant adjustments of theoretical findings are considered core principles in a design experiment (Cobb, et al., 2003).

During the last week of Money Club, I conducted a second round of interviews with the same individuals who agreed to an interview before the class started using the same prompts as the pre-interview. I wanted to explore the nuances between the participants' answers before and after their time in the Money Club. I asked the questions and allowed the interview to move in the direction that the individual felt was important. I completed one last design notes form to wrap up my beliefs as a teacher in the class. In Table 1, I display the participants, assent/consent signed, those who participated in pre and post interviews as well as the number of classes they attended.

Table 1

Participants and number of classes attended

Participant	Consent/Assent	Pre-interviews	Post Interviews	Attendance	Audio Data Used
Lynne	Yes	Yes	Yes	75% (9/12)	Yes
Helen	Yes	Yes	Yes	100% (12/12)	Yes
Amy	Yes	Yes	Yes	100% (12/12)	Yes
Mindy	Yes	Yes	Yes	92% (11/12)	Yes
Wes	Yes	Yes	Yes	92% (11/12)	Yes
Robert	Yes	Yes	Yes	83% (10/12)	Yes
Antonio	Yes	Yes	No	83% (10/12)	Yes
Gary	Yes	Yes	No	92% (11/12)	Yes
Patrick	Yes	Yes	No	75% (9/12)	Yes
Alejandro	Yes	Yes	No	75% (9/12)	Yes

Finally, I organized the data corpus and retrospectively analyzed the program and all the documentation including audio, by developing codes and using coding sheets. I used a coding sheet to develop the themes that are discussed in Chapter 4 and Chapter 5. The coding sheets were developed after an initial listening to the taped class sessions, and then certain codes assimilated into similar codes while others were removed. The final coding sheets allowed the themes to emerge from the data, which were Problem solving, Money habits, Scams, and Empowerment and advocacy. This final analysis made sense of the program as well as generalizes the findings to other areas of study. It also generated new questions to be answered in further study.

Instructional design (mathematics practices). The second component of a design experiment, instructional design, is used to generalize findings within a study to further the development of theory. The researcher steps back from the completed teaching and can view the completed learning trajectory of both the teacher and the class, which draws into the creation of a new instructional design (Bowers, Cobb, & McClain, 1999).

Grounded improvisation. The preparation for each class was exhausting, yet necessary to competently perform, take risks, fail, and recover. I worked hard to prepare and it gave me a lot of chances to make mistakes without losing the class. We developed a trust where even when things were not going according to plan the participants looked to me to right the boat. The preparation allowed me to improvise and the payoff was so enjoyable I respected that time and faithfully adhered to my schedule of mini cycles believing it would pay off. I taught only two classes per week; however, I was weary from the type of labor and deep cycling required in completing this study.

Formative evaluation. During the formative evaluation, the researcher searches for flaws within the study and addresses them explicitly (Edelson, 2002). These flaws can be in implementation, strategy, or participation within the study. It is a self-reflection that utilizes the data collected as a background for analyses and improvement. The goal of this evaluation is continual improvement.

Data corpus. The data corpus is all the documentation collected throughout the research study. It includes the initial and shifts in conjectures; decisions made, reasoning involved, and their consequences; as well as any videotape or tape recordings of the classroom and interviews (Bowers et al., 1999; Cobb & Whitenack, 1996). The data corpus is a completed snapshot of the study and its aggregated data, which is retrospectively analyzed and used as a second product in the study. In this study the data corpus is the pre-post interviews, design notes form, lesson plans, and taped class sessions.

Generalization. During this phase, the researcher takes both the study's map/initial conjectures and retrospective analysis and views it from a larger, global perspective (Stephan & Cobb, 2003; diSessa & Cobb, 2004). Both initial and actual conduits of learning are examined, which generate a new theory for use in the next experiment (Bowers et al., 1999). The teacher looks at the total findings of the study and applies them to other areas of research. This new body of research not only improves the teacher's instruction, but also is meant to be shared in the teaching community. It is the final phase of a design experiment study. See Figure 1, organized from research on design experiment procedures (Bowers et al., 1999; Cobb & Whitenack, 1996; Gravemeijer, 1994; Stephan & Cobb, 2003; diSessa & Cobb, 2004)

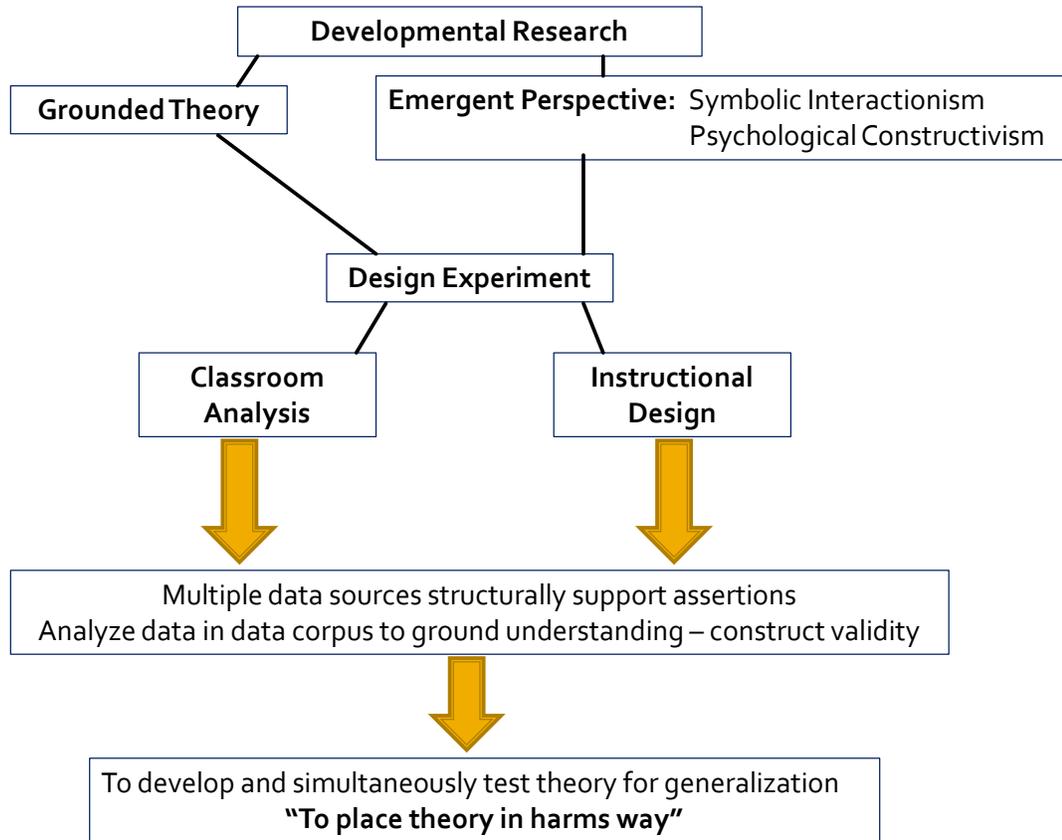


Figure 1. Data Analysis in a Design Experiment

Classes one to twelve recap. Recapping and mapping out the classes one through twelve helped in continued improvement of my teaching. I cannot stress enough how easy it is to forget or creatively reconstruct what really happened within a two-hour class. My brain filled in the missing pieces and smoothed over the rough parts if I did not train myself to look at all the problems that occurred within any given class and look for solutions. Methodically listening to tape and reliving the experience brought back all the details that even the best memory cannot recall.

Every class had a theme to work from: The art of being cheap; Why to never buy anything except for a fountain soda or coffee at 7-eleven (smart shopping); Composition and

decomposition (joining and separating); Pawn shop mathematics; Credit cards are evil; Smart saving; Pay Day loans are predatory animals (applying for a real loan); Don't trust an investor in a bow tie (investing and Ponzi schemes); and Fraud and you. I wrapped the mathematics around these big themes. It helped me plan the process for teaching these themes. It was exciting, looking at a problem and working with supports to ensure that each member was learning something. I wanted to make sure every lesson hit a nerve with the audience, to keep them coming back. It was apparent after the first class that no one had anything holding him or her there except for their interests.

Within the framework of a 6 week thematic unit on the financial applications of algebra, there were 12 mini cycles that would become the lessons. Each cycle had four components: The design notes (pre teaching) that informed the frame of the lesson plan, the lesson plan writing itself, the teaching of the lesson, and the next design notes form (post teaching) that forced me to sit and think about all the problems and successes of the previous lesson. These cycles would become an engineered teaching experiment that formed the concrete foundation, which freed me to invent in real time, within each lesson, and still stand focused in front of the class.

This mini cycle for the completion of each lesson reminds one of the learning cycle in Zull (2002): Active testing (lesson plan writing), concrete experience (teaching of the lesson), reflective observation (design notes form; post teaching) and abstract hypothesis (design notes form; pre teaching framework) (p.40). The transformation, or learning experience that spurred growth in me as a teacher would occur during the design notes writing following teaching consistently just like the findings in Zull's work in the reflective observation

component of the cycle. At times, I boxed myself in a mental corner, unable to solve the puzzling learning behaviors I was watching. After few hours of reflection, I was able to see the problems and document them in the design notes form.

The structure of the design experiment planning forced me into a cycle of improvement that also built deep connections to my students' learning. I had to review each and every situation multiple times to see if my initial conjectures rang true for the next class. It also sped up the learning curve in the area of accommodations and support structures for their learning. Normally, it takes me over a month to dial into each student's strengths and areas of improvement and to begin to move them forward. In this class, most of the learning began to tip in a positive direction during Class 5, at the beginning of the third week. The increased response time would be very valuable in the classroom that I teach in now.

Methodological Assumptions and Limitations

Assumptions. Consistent with design experiment methods the assumption in my research was that I would develop theory for both personal classroom use as well as for use in the community I work in. The community in which the research would appropriate is teaching algebra to adults with DD. It is assumed that since I created the curriculum of the Money Club that I have been acting upon prior experiences within the classroom, taking from the successes and failures of my teaching career and improving upon them. The Money club and all the teaching within it were an extension and improvement upon my prior teaching. In this, I assumed that the teaching, assessment, and curricular theory created from the Money Club could be used by another teacher with similar classroom diversity and be relatively

successful. The expansion of theory in regard to mathematics and people with DD emerged within this study.

Limitations. I am under no illusions that the results of the Money Club are purely due to the teaching methods, curriculum, or any other pedagogical variable. The major limitation to replicating this study lies in this study's main strength; the training, support and prior self-determination skills of the participants prior to my work at the Metropolitan League of Self-determined Individuals. The participants in this study were already primed for a challenging mathematics curriculum through their prior experiences as self-advocates and through the training of the league. The League and its effects upon individuals with DD is a heavily weighted variable, which factors into the success of the Money Club tremendously.

Conclusion

A design experiment is rooted in developmental research, which emerged from daily practice and generates theory with detailed documentation of the adjustments the teacher makes to impact instruction (Gravemeijer, 1994). A design experiment is comprised of two interwoven components: classroom analysis and instructional design. The data are analyzed at multiple points throughout a given study. A design experiment best fit my research question due to the inherent flexibility combined with a structure of reporting that helped organize the results. It also allows the researcher to develop the instruments based on prior knowledge, which incorporates and draws from the experience of the teacher within past classrooms as reasoning for instrumentation choice and deployment. The design experiment was able to capture through multiple data points the experiences of the participants of the Money Club in a systematic fashion. The research was conducted during 6 weeks over the

summer of 2010 at the Metropolitan League of Self-determined Individuals in a southwestern city in the United States.

Chapter 4: Results

Introduction

The purpose of the study was to investigate the experiences of young adults with DD and me, their teacher researcher, about mathematics, finance, and self within a 6-week program of instruction titled the Money Club. This includes how adults with DD reason, apply, perceive, and solve applied mathematics problems in finance. I wanted to learn in particular: 1) What specific experiences affected the beliefs, perceptions, and classroom actions that emerged for participants and their teacher during the Money Club. More specifically: a) What themes emerged within people with DD as participants? b) How did the experiences – the beliefs, perceptions, and classroom actions impact instruction and planning from the teacher/researcher? c) How are spending habits and financial abuse by others addressed by higher level mathematics for people with DD? and d) What specific supports within mathematics instruction were used to deliver the information? This was investigated using a design experiment, which included pre and post interviews; a 6-week study called the Money Club; and a design notes form, which directed the lesson plans. The design notes form tracked teacher experiences and influenced the lesson plans that was written each day of the study. Two months after the study ended, a retrospective analysis of the data corpus was conducted. It included transcripts of pre and post interviews, design notes forms, 12 taped class sessions, and lesson plans for the study.

Four themes emerged from this data corpus: Problem solving of applied mathematics; money habits; scam understanding and avoidance; and ultimately empowerment of the individual. The data suggest that not only can adults with DD learn the basics of algebra

when applied to money and finance; but also they can think creatively and solve these problems using invented strategies. The fixed money habits of the participants in this study also emerged as a pattern in casual and classroom conversation where participants talked about how they spend money. Scams impacting the lives of people in money club were an emotionally charged subject and became a topic that angered the participants. In discussion, they supported each other. Finally, the empowerment piece summarizes what happens when people with DD learn a new skill (mathematics) that they thought was not possible. Many of the participants felt that if they could do mathematics, they could do other things that were challenging.

Money Club became a safe place where adults with and without disabilities could work side by side, socialize, have snacks and leave each night believing that they could do things that previously they could not. Money Club is about the power of community and specifically places like The Metropolitan League of Self-determined Individuals for people with disabilities, where people with disabilities go to improve their lives. This study and the experiences of the participants are strongly influenced by the impact of the league on the participants and me. This study addresses the importance of high expectations of all people, that hard work results in small improvements, and small improvements over a long period of time can equal tangible results.

The study is important in that it challenges prior thinking that people with DD are exempt from learning mathematics at high levels and should learn only life/job skills. This offers an alternative: that people with DD should learn both. They can learn valuable life skills, which we all learn, and also learn basic algebra skills that can apply directly to

avoiding scams, managing money, and becoming more empowered by taking a stand for themselves. Algebra helps people understand exactly why a high interest credit card is a bad idea and how small fees affect future financial freedom. Life skills and algebra should be taught together; one reinforces the other. Mathematics for its own sake and without context, while fascinating for some, removes meaning. Preaching about the evils of debt without the support of numbers and algorithms falls on deaf ears.

In this chapter, I outline how money club affected each member, including me. I reason about my initial conjectures and planned learning. I reflect on the hypothesized themes or the themes I thought would result from the study, and then explain how I came to discover the actual themes in the study. I discuss each member's history, perceptions, and conjectures about money and mathematics. I develop theory specific to adults with DD and mathematics based on the data corpus and explain the themes of the club and how I decided to choose these themes. I will explain how the instructional design of the Money Club moved in a specific direction, informed by the design notes and action within the classroom. The framework from which this chapter is written was forged by the design experiment which includes: initial conjectures (teacher and pre-interviews), ontological innovations (theory building), instructional design (mathematics practices), and post interviews.

In this next section, I will explain and answer the responses to my interview questions. I wrote these interview questions based on my hypothesized themes. I will address each hypothesized theme then later compare them to the actual themes of the Money Club. Much of the information that was taken from these initial interviews later informed me of the themes I used to describe the study. While my hypothesized themes were too broad

and lacked the specificity necessary to understand the Money Club, they were critical in paving the way for the eventual ideas and themes of the study.

Participants conjectures: Pre-Money Club interviews and hypothesized themes.

Prior to the six-week instruction of the Money Club, I conducted interviews at the Metropolitan League of Self-determined Individuals. The interviews were meant to enhance my understanding of the experiences of the members of the Money Club. They were also meant to explore my hypothesized themes; those themes I thought would emerge from the study. The interviews ranged from 10 minutes (Alejandro) to 40 minutes (Wes). There was a pattern between the amount of time spent interviewing and the age of the participant. All those over the age of thirty spent more than 30 minutes answering questions, while those younger than thirty spent less than 30 minutes and answered fewer questions. I wanted to understand how each participant perceived the nature of mathematics, school experiences in mathematics and special education, their understandings of how credit works, and the impact of teaching and learning within mathematics. A side concern came out in the pre-interviews that bears repeating: the impact of the Supplemental Security Insurance (SSI) limitations and ceilings that the members of the club depend on to live well in the community. The questions for this section are found in Appendix A. I used coding sheets to distinguish between the four groups, with SSI benefits and restrictions added as a core concern.

Nature of mathematics. When I began the interview, I asked each participant the purpose of mathematics, or “What is mathematics used for?” Lynne responded with “Everyday basic life.” (p.22, interviews) Robert said “Mathematics is used for keeping

money in order.” (p. 28, interviews) Some passed on the question and said, “I don’t know.”

Helen responded with the most in depth answer stating,

Count things, and numbers, do inventories and other important things...Like supermarkets do inventory, like...like, uhm, how many boxes of Cheerios they have, like uhm, how many gallons of milk they gonna sell, things like that...yeah and mathematics is used for real estate accounting, things like that. (p.10-11, interviews)

Helen had a great deal of experience working at the league watching others audit their accounts, stocks and money used. She could see firsthand how people used numbers and how important the application of mathematics is.

I later asked, “When I say the word Algebra, what do you think of?” Mindy said “Fractions...I don’t know...Hard, though” (p.5, interviews) Kathryn responded with “X” (p.8, interviews). Helen nervously talked about “Algebra, uhm the top mathematics subject, well and long division is difficult.” (p. 11, interviews) Again many passed on the question, telling me to ‘pass’ or I don’t know. Lynne talked about her mathematics anxiety, and stated that “It is a bunch of numbers; it has square roots and stuff.” (p.22, interviews) Thinking of what the nature of algebra was seemed to stump them, and in Lynne and Helen’s interviews brought up feelings of anxiety. The real fear and uncertainty of completing algebra problems certainly would be a roadblock to discovering if they would be willing to solve problems in the club. It became apparent that I must extensively monitor the anxiety levels during algebra instruction to get the best out of the group.

The nature of mathematics within the special education classroom for students with DD is a concern for anyone setting high expectations and learning mathematics beyond the

concrete, basic, operations that seem to dominate instruction in self-contained classrooms. Lynne voiced her frustration with the low expectations of her teachers. “Well, they just teach you the same thing over and over again...my multiplications, or my divisions, the rules, or anything like that...They never, uhm, they never chall...challenge you. They just kept you the same, uh, level.” (p.23, interviews) I asked her how she felt about that and she replied with “It made me feel really bad. It did make me feel that I was not smart enough!” (p.23-24, interviews). She later went into how boring adding and subtracting is. She felt that mathematics got easier as she enrolled in community college because they did “activities...exercises in class...cause it helps you relax and get more comfortable with mathematics.” (p.22, interviews). Talking about her mathematics anxiety course, as well as the different teaching methods compared to her prior schooling seemed to positively change her outlook on mathematics.

Mindy exemplifies what I see with many of my students when she stated, “Mathematics is good if I know how to do it; if I don’t I use a calculator.” (p.5, interviews) She will take charge when she is confident and fall back on the ultimate mathematics crutch – the calculator, when she is unsure of herself. She also talked about how she was feeling about spending six weeks of her summer in a mathematics based money club. “Oh, no! Money club...I don’t know. When my mom called, she said ‘You should take this class.’ I’m like, I don’t know, I don’t want to have my whole summer to be all wasted... but whatever.” (p.5, interviews). As leery as she was in coming to the first class, she was straightforward in her concerns that; a) mathematics is work and I am on vacation and b) mathematics is not as much fun as having free time.

School experiences. Out of the eight individuals who agreed to do interviews in addition to the six weeks of class, five claimed that an elective class was their favorite in high school. Three stated that mathematics was indeed their favorite class; however, during the three interviews I got a sense that because they knew I was a mathematics teacher, they were sensitive about talking badly about mathematics. Helen meanwhile loved music class. Wes, Amy, and Mindy loved art class. Lynne enjoyed measuring and cooking in home economics (interviews). Because elective classes are often the only classes in which people with DD get an opportunity in which to be included, it is unclear whether their popularity or is due to social opportunities or the subject itself.

Wes did not have positive experiences in high school. He was in a “side by side” program where he was expected to do work in the self-contained classroom and to build job skills outside in the community, with a teacher or paraprofessional at his side to assist. He was not happy with the program and still looked back with a critical eye on his schooling “They just did not treat uh, students’ right. Uh, my mom just, just, decides to graduate me early, because I wasn’t not going anywhere.” (p.1, interviews) He went to college, but he felt they were not supportive of him and his disability, so he left. He still wants to return to college to prove that he can be a success in school.

Robert had a completely different experience attending a neighboring high school. He claimed to be a “mathematics wizard” (p.28, interviews) and stated he can do anything he sets his mind to. He hinted that much of his confidence came from the teachers who supported him throughout the middle and high school years. He remembered one teacher specifically, “Ms. Helen Xavier, who I miss most of the time, she always told me ‘Y’all are

the best students. Y'all going to be...Y'all are going to make me proud of you' or something like that, I can't remember" (p.29, interviews). Clearly, he remembered how he felt learning in her class. This sustained positive learning experience of seven years ingrained this statement that he is capable of anything.

Helen and Lynne are both older members of the class and were in segregated settings in school for most of the day. They both admitted to lower levels of expectations and curriculum. Helen stated that, "When I took basic mathematics I pass all the time." (p.11, interviews) She worried about taking an algebra course and her answers became more strained after I asked what she thought of the subject. Lynne immediately mentioned her mathematics anxiety after the same question. (interviews)

The differences in outcomes for Robert and Wes, these equally capable individuals, were heavily influenced by the teacher, the classroom environment, and the degree of support, which they received. With Helen and Lynne, not having access to higher level instruction affected their opinion of mathematics and each wanted to be exposed to work outside of basic facts, but thought algebra was outside of this zone. The effect of their educational experiences and perhaps their teachers was substantial.

What is credit? No one in the group understood the nature of credit, other than they have check cards. Some participants had cushions in their savings accounts that prevented them from overdraft fees. The line of questioning on credit came up empty and I wondered how I could have re-structured the questions to get at their ideas on this subject. I contemplated whether the questions could have been written better and also how the individuals may not have enough experiences in the area of credit to talk about it at length.

Teaching and learning. I explored what the participants perceived as an ideal learning environment and identified components of good teachers with questions like “How do you learn best?”, “What is mathematics like for you”, “Tell me about mathematics in school” and “What did your favorite teachers do to help you be successful in school?.” I probed ways that they learn and what techniques were most successful for them in school. I incorporated this to understand it as a baseline for the research as well as tips for how to work with them successfully in the coming six weeks.

Helen and Lynne were clear about which learning styles they were most likely to use during instruction. Helen said, “I am a visual learner and when people show me how to do something I watch them.” (p. 12, interviews) Lynne said “Hands on.” I referred to her (p.26, 40, design notes form) as a visual kinesthetic learner, or a watch and do type, who may learn similarly to Helen.

Mindy stated that she independently learns from examples in the text, while Wes learns best with other people. Mindy had been homeschooled until her freshman year in high school and this style of learning may have been a function of necessity. She grew up in the northern region of the state, among the small, isolated, towns. This isolation compounded with the lack of peers in her home school situation, may have forced her to learn this way. Wes, in contrast, learned in a public high school, side by side with others, and although he may have seen this program as a negative, it may also have impacted his learning style of working with others.

The impact of Supplemental Security Insurance on earning potential for people with DD. Finally, Supplemental Security Insurance (SSI) emerged unexpectedly as a

concern for both Wes and Helen and bears repeating here. It is the single most important need during a transition to post-secondary living meeting for a person with DD at the schools where I have worked. Filling out the proper forms, demonstrating needs, getting signatures and approvals can take many months or years. It is as much a test of wills as it is a delicate and meticulous act. The Transition team makes sure proposed programs support the individual so they can live as independent a life as they are capable, while balancing it with proper community and site-based care to protect the individual. The team asks “How independently can this individual with supports live and still provide protection from harm.” This concern alone was worth the time spent interviewing the individuals before starting the study for it would inform and guide my instruction throughout.

The way the system is structured right now creates a fear of money in individuals with DD. Individuals with DD are granted limited money to live on and must save well to cover costs; however, they must not earn or save too much or they risk losing all their benefits, which include medical benefits and devices that can be worth tens of thousands of dollars – some need periodic service or replacement every few years. The monthly money they get is very small in comparison to the cost of treatments, individual care workers, medicine, and machines that they need to live a full life. Helen and Wes voiced their concerns about the system and how worried they were about losing benefits. Wes’ worries came out in class. Helen’s came out in the pre-interviews.

Helen has a part time job at the league in which she takes great pride. She said that there is “No place like this job, no way!” (p.10, interviews) She wants to work at the league full time, but stated that full time work would cause her to lose her supplemental security

insurance (SSI). “Social security pays me like, uhm, \$700, I can’t go over \$700 when I work here, so I only work part time because of that. If I go over, they would take it away.” (p. 13, interviews) She has been working to get her own apartment, earn a real living, and manage her own money, but she ran headlong into a system that does not reward her for working longer hours, getting promoted, or making more money – if she got a raise she would need to cut back on hours - which may negatively impact her status at the league - to fly under the \$700 earning ceiling.

This conversation came out after I asked her whether she has a budget or not. She responded with,

Not really...it’s hard to uhm, budget when you make uhm not that much money. And uhm and uhm social security is very picky about how much money I could make and what bother me, that a lot of people’s disability only get by and need a vast amount more money, it’s awful. (p. 13, interviews)

Through Helen and Wes I gained insight on the problems within a system they live with every day. It is one that like many welfare programs does not reward progress or hard work, keeping people disabled and dependent.

The pre-interviews proved a valuable tool for learning about the ten research participants’ perceptions and skills in the areas of, the nature of mathematics, school experiences, what is credit, teaching and learning, and the core issues in the SSI debate for people with DD. I looked at the problems they faced and certain areas that I needed to address with the Money Club. I learned that certain individuals do not like interviews while others tried to parrot back what they thought I wanted them to say. It was both a great way to

get to know the individuals and also to understand the needs that the Money Club could potentially meet for them in the coming weeks.

The Core Participants' Background

There were 10 members of the Money Club that I counted as core participants, four women and six men. Ages ranged from 22 to 45 years of age, with a mean age of 30. Most Money Club members had multiple disabilities, all participants having in common a DD. The information regarding each individual's disability was obtained from the Metropolitan League of Self-Determined Individuals. The information regarding the background and other details of each individual was obtained in interviews and during class conversation.

Lynne. Lynne is a 45-year-old female with bi-polar disorder and an intellectual disability. She is from the southwest and spent a lot of time in both northern areas and close to the border of Mexico. She is currently employed at "The Valley of Fire," the basketball complex of Hot Springs University, where she is an usher. She is taking remedial classes at a community college. She has been a member of the Center for 1 ½ years.

Historically, Lynne has been underemployed and has spoken about her challenges with getting the jobs she would like. "I applied to work at a cash register, but they rejected me because I don't have experience, but they said I could be a bagger."(8:10, Class 5) She accepted this minor setback as a universal rejection from ever working the cash register and did not go to other stores to apply.

In the first classes of the Money Club Lynne displayed a lot of self- defeating behavior and did not believe in herself when answering questions. Often times I caught her with the correct answer, to which she sheepishly replied, "So I was right?" or "I don't want to

answer” (P. 47, 49, & 52, design notes form). She worked through a lot of issues at the time of the club, and from talking to her I gathered that this is a common theme in her life. At the time of the club, she fought with her guardian over basic freedoms and her ability to spend money. She wished that her guardian trusted her to spend money. She also wanted permission to marry a much younger man in his twenties; the group playfully teased her about being a “cougar.” Lynne stated that she was involved in abusive relationships – boyfriends stole money and jewelry, hurt her physically and emotionally, so she at one level understands that people want to protect her, but stated that she wants to have the freedom to make choices (p.22, 48, design notes form).

In the Money Club, Lynne worked well with every group I placed her in and helped the younger members. She treated her peers who were struggling thoughtfully and with empathy. Still, she appeared quiet, nervous and self-conscious during the beginning of the club. Her past lingered in the front of her mind and she allowed it to get in the way of realizing her potential, for she brought up seemingly out of the blue, issues that happened in the past which somewhat were related to our class discussion, or would tie life experiences into class discussion often (p.22, design notes form). I documented that

Lynne was not present for the basic skills part of the class, but I noticed that she needed a lot of external focus or reminders or guiding questions to get her back to the question I asked her. She would take a few of the words I said, which triggered a memory, and then went into her past which, from what I noticed had been traumatic and filled with people taking advantage of her. (p.22, design notes form)

It took her almost half of Money Club to turn things around, and when she did, she emerged as one of the three core leaders in the group.

The turning point for her happened midway through Class 5, when I began asking for ways to find fractional amounts of numbers. Lynne was helping others in small groups solve for $\frac{1}{2}$ of easily divisible numbers and her strengths in basic mathematics skills began to emerge. When I reconvened to a whole group setting and began asking questions of the groups, Lynne came up with an invented strategy for finding a $\frac{1}{4}$ of a number, that I will expand on later in this chapter, which she called “ $\frac{1}{2}$ of a $\frac{1}{2}$ ” (p.40, design notes form). This was the tipping point that set the stage for the rest of Money Club for her and for the rest of the group. Once the group saw Lynne break out of her shell and start answering questions, as well as opening up about her life and past financial choices, the rest of the group followed suit. Later in Class 6, Lynne told me that “I am so much more relaxed in this class than before.” This spoke to a need for her to feel safe before engaging in the class, unlocking her true potential.

Helen. Helen is a 42-year-old female with Autism and Traumatic Brain Injury (TBI). She is originally from the East Coast, where she went to high school. Her adult life has been spent in the southwest. At the time of the study, she had just obtained an apartment downtown on the bus line. She slowly acclimated herself to the area by spending a few hours at the apartment and then going back home, increasing time as the weeks went on. She works at the Metropolitan League of Self-determined Individuals as an Advocate trainer where she worked for 4 years.

Helen started and ended Money Club as a peer model and leader. She helped many of the members, including Robert.

Helen is a great sounding board for Robert and she also gets him back to work when he goes off on one of his ‘I want to let you in on a secret....’ Alternatively ‘As a reporter I know....’ tangential thinking episodes. (p. 24, design notes form)

She had very strong basic mathematics skills, especially in multiplication, as documented in the first four classes (p. 19, design notes form) coupled with a kind yet firm demeanor, which naturally applied itself to teaching others mathematics. She also brought a mothering influence to many of the shy members, looking out for them and offering support. In one instance, Gary was drinking Gatorade, glass after glass, and Helen softly told him “Don’t drink too much too fast, drink slowly” (11:04, Class 7). Helen remembered that Gary had a serious incident the year prior when he drank too much water, which caused congestive heart failure. She knew how lucky he was to survive and checked on him often.

She is also tough and could hold her ground with the people in her group when necessary and forced each member to solve problems on his or her own. I was captivated during Class 7 by how she could get her peers to continue to work on a problem that was frustrating them without ever giving them the answer. I applauded her skills, “Great job being the leader, you are nice to them, but never give them the answer.” Helen replied matter-of-factly, “Then that would be cheating!” (34:36, Class 7) She took to working with members of the Money Club as seriously as she takes her job at the league. The only time I saw her lose confidence was when the group was visited by two individuals who made her

feel uncomfortable, one male, and one female. Later in this narrative, I will detail the situations and discuss their impact on the groups.

In the six weeks I worked with Helen, she spoke of the difference between people with disabilities like herself and people with Emotional Disturbance/Behavior Disorder (EDBD), stating “We don’t get along with people who need medication.” What she is not aware of is the prevalence and cyclic nature of abuse that some of these individuals have endured. It is a sensitive issue that teachers must address: How to stop classroom intimidation without taking away opportunity to learn the advocacy and self-determination skills through dealing with fears. Facing and working through our fears can be used to teach resiliency.

She felt apprehensive of sharing any negative information with the group about her involvement in past scams or even character flaws that we all have. When the group talked about people who have taken advantage of them, she replied “There were times, yes!”(28:38, Class 6) followed by nothing else. She spoke briefly about liking to go to the casinos, then took it back and said that it was bad. She had no problem talking about spending all her money at Borders on books and CD’s, which is socially preferable to spending it all on gambling. I viewed this as one of her money management concerns, but one in the process of reform.

Amy. Amy is a 26-year-old female with Intellectual Disability (ID). She works at a grocery store as a sacker. She lives 40 miles east of town, on the other side of the Sangre Sierra mountains with her family. She has a boyfriend, who became her fiancée a few months after Money Club ended. A few months later, she ended the engagement. She has a

history of bad relationships with men and looks to her family for support from the fallout of these relations. Her mother and stepfather are central figures in her life. She has been a member of the league for 1 ½ years

She is fascinated with gang culture and talked about “getting tattoos and partying.” In our final group photo, she was flashing gang signs so often that we had many retakes. She talked about the sketchy people in her life who both interest her and take advantage of her kindness and trusting nature. Her boyfriends stole items from her and borrowed money and never repaid the debt - she bailed one out of jail and he thanked her by never paying her back (Class 6). While still interested in this way of life, she also realized that she needed to find people she could trust. This dilemma plagued her, both during money club and in the few months after when she broke off a quick engagement to a male who was seeing other women.

Amy told me the first day of class that she hated mathematics, yet came to every single class of money club. She was very social, and if I let her talk off topic she could socialize all class. I am glad I did not, because she was truly one of the hardest workers in the club. During the first class, she joked about wanting to use her cell phone as a calculator after I told the class if they needed a calculator I could give them one stating, “Hey a cell phone has a calculator for mathematics.” I responded with, “I hear that all the time, but what do you think my students are really using it for?” She replied, “Texting”.

After this conversation, and one slip, I never heard her ask for the cell phone again. She needed to be held accountable in a gentle manner for her learning and praised for doing the right things. Her ability to answer problems in class was directly linked to her moment-to-moment disposition about mathematics and the class. She was vocal about her feelings,

and after getting a division problem wrong she stammered “See! This is why I hate division! And I’m not good at mathematics!” Amy needed a lot of intermittent encouragement at these times followed by a more directive styled coaxing, as I spoke to her partner, “I want to see Amy solving the problems, she can do it!” Once she got a few right she began to engage with the groups and become a serious student. For example, I wrote about an incident with another member that really bothered her and how we repaired the relationship and came back together as a class.

Normally when students fight with each other (and this one is minor), the class absorbs that negative energy and needs to recover in order to move on. It is like the fabric of the class tore and I needed to stitch up the wound or else, with use, the fabric will continue to tear. I processed the situation with Amy in front of the class in a delicate way. Amy was very upset at Rex (for yelling at her) and mumbled a lot under her breath with a scowl on her face. I reassured her that things would be ok and that (although) she was talking too much and that bothers people trying to listen, that people should not ever talk to her in that way. I also complimented her that she was rebounding from the situation and coming back to the class. I was actively trying to get her mind back into a positive place and pulling her back to the class and out of the negative space she was in, (she looked stuck in a cycle of negative self-talk). I also let the class know that I was handling it in a safe way and also that I am not going to allow all the side talking that was bothering them. (p. 41 design notes form)

She is a very social person and will be led astray by those around her who want to talk. She also does not completely believe that she is a smart student, but feels good when

she is working hard. I had to be aware of the influence others had on her – she needed to show the hard working side of her, and not the social butterfly, to be successful in mathematics.

Later in small groups with her partner, after she solved a few problems correctly, the class became a manageable challenge for her and her engagement increased. After solving a problem correctly, she stated with confidence to Patrick, her partner, “O.K. Now I am going to give you a hard one!” This back and forth between the two worked for 15 minutes, each one raising the bar for the other, but doing so in a safe environment. Amy thrived in this manner of instruction, and negative comments would invariably decrease until we started on a new concept, where her confidence would hit the floor again. By the end of the Money Club, I saw that she was both exhausted and proud of herself for fighting through the peaks and valleys of the course.

Mindy. Mindy is a 27-year-old female with DD and Speech/Language disability. She does not have a job, but is going to Central Community College full time. She plays volleyball in a women’s league in town. She is originally from the northern part of the state, from an upper middle class family who now live a few blocks from Hot Springs University. She lives with them. Her family is a great support for her and she spends most of her time with them. She has a driver’s license and her own car. She knows sign language and has taught a class at the league in signing. She has been a member of the league for one year.

Mindy was also a very dedicated member of the club missing only one class due to a prior engagement with her college. She also engaged her group in argument, specifically about mathematics and how certain answers were correct and certain ones were not. She

gathered data about a problem and when she was felt her answer was right, could not be convinced otherwise. She was stubborn when she thought she thought she was right and would need a lot of evidence to bring her around. I always knew that whatever group she was in would learn because of her focused attention and task management. In one instance, I did catch her texting (1:13:18, Class 5), but once caught she stopped doing it for the rest of Money Club.

She would get offended when someone (mainly me) would challenge her on how she got the answer; she would reply, “I am not cheating, I got the answer myself!” Mindy was very serious about being a good student, she would remind me most every class that I once accused her of cheating and would make sure every answer she came up with was hers and that she would never cheat. She also defended herself when I wrongly accused her of talking “Mindy got mad at me and said, ‘you thought I was talking but I was trying to listen to you and ignore Mark.’ I thanked her and apologized.” (p.46, design notes form). I often made many apologies to her and eventually Mindy came around and start smiling and got back to work.

During Money Club, I did not get a sense that Mindy had ever been taken advantage of, stolen from, or manipulated into doing anything she did not choose to do. In fact, during most discussions about scams, she looked lost while the rest of the group talked passionately about who stole what from them. When I redirected the discussion to her, she said plainly, “I can’t think of anybody.” The group went back into discussion and Mindy sat there in the left corner of the room listening to her classmates. I wondered what she was thinking of her peers living life different from what she was brought up to do.

Her stubbornness and clear reasoning between right and wrong kept her out of trouble. It also protected her from her natural self, which is trusting, caring, and wants to make the teacher happy with her as a student. For example, during a lesson on impulse buying, I told them a story of how my friends would not come over my house to watch sports because my television is very old and the screen is small. I told them that I could react to peer pressure and go out and buy a flat screen or I could keep my T.V. and just go to their house to watch sports. I joked about my situation to let them know it is ok to not keep up with your friend's new gadgets and hold on to your money.

Wes. Wes is a 44-year-old male with Cerebral Palsy, motor disability, and has a Ventriculoperitoneal Shunt (V-P Shunt). He is a warehouse worker who lives on his own in the metropolitan area. He takes the bus everywhere he goes, pays his own bills, and prides himself on being independent. He is a healthy and strong individual who wants to help others at the league gain the type of independence he presently enjoys. He has been a member of the league for two years.

Wes came into the Money Club with clear goals for learning how to manage his checkbook and balance his budget. He often focused on taking charge of his finances and after he shared how often people - mainly his family and agency workers - took his money and property, I could see why. His parents "took my SSI checks" and an RSAC agency worker "took \$500 dollars after they said they were going to help me" another worker "took my stuff and resold it." (26:30, Class 6). He later brought it up again in Class 10 stating, "I lost my benefits at one time because my parents took my money!" - referring to his SSI

checks. He wanted to take the class so that none of this would ever happen again. I felt a great deal of responsibility to the group after hearing these comments.

Wes also acted like an elder statesman and role model for the younger members of the group. In order to help them avoid them in the future, he bravely shared his past mistakes in trusting others. He cautiously spoke of one time at Central Community College (then Central Technological College), when two students “flipped my wheelchair and security did nothing!” (1:17:17, Class 6). He used his own life as background for solving mathematics and finance problems. He told us that he is not allowed to have more than \$2,000 in his savings or he will lose his benefits. The class worked with him on how to spend wisely so he can save more. He said he would like a new bed because “I have an old hospital bed” (30:38, Class 9).

Wes has seizures often and needs to be taken into a quiet area to work through them. During Class 9, I heard him say repeatedly “I am sorry, I am sorry...” and he began to have a seizure (58:45, Class 9). He did not want to leave the room and luckily Destiny came in at the right time and we moved him into the side room. She stayed with him until he felt better and the Desert Van came to pick him up. It embarrassed him, but at the same time he knew that the people at the league always take care of him and they did.

Wes was a natural at understanding patterns and using function tables to see linear equations. For example, I noted in the design notes form

During the paper folding/cutting activity, Wes was able to crack the code using a function table (with each fold the difference between folds would double (1 fold/1 cut = 3 pieces, 2 folds/1 cut = 5 pieces, 3 folds/1 cut = 9 pieces). The rest of the class was

guessing incorrectly that the distance between number of pieces would increase by 2 each time 2, 4, 6 in between each number and he was able to think independently, make a conjecture on the relationship and back it up with solid reasoning – “you will be increasing by 4, no...you will be doubling it. (1:49:48, Class 7; p.56, design notes form).

He was also adept with fractions.

Wes when solving for $\frac{1}{2}$ and $\frac{1}{4}$ of 20 said he could just see the answer in his head and could clearly state that $\frac{1}{2}$ is 10 and $\frac{1}{4}$ is 5. He was able to visually dice up the number into equal pieces. (p.50, design notes form).

This natural skill that he would compute in his head, came from his job which organizes and moves supplies around in a construction supply warehouse. He could, by Class 11, solve 2-step linear algebra equations, working out the problem in his head and leaving numbers on the page as bookmarks for the next step. When I looked at how he solved the problem, it appeared that procedure was partially erased and only the answers remained for each line in the problem.

Wes was another leader in the class who went out of his way to help the younger members. His influence on them was strong and sometimes he would joke with them not knowing how heavy an effect that joking would have until after. On one occasion in Class 4, the class estimated how much a pound of bananas cost at the store, Robert proudly said “\$12.00 for one pound.” Wes said to the group jokingly “They must be made of gold, man!” Later in the class, I could tell Robert’s confidence was shot, because when I called on him he always wanted to talk, but this time said, “I am afraid of getting the wrong answer.” I looked

over at Wes and he knew that what he said earlier affected Robert. He felt bad and spent the rest of class trying to build him up by complimenting him often. He went back to being the leader for the rest of money club.

Robert. Robert is a 30-year-old man with Porencephaly and Spastic Triplegia, with low vision and a Ventriculoperitoneal Shunt (V-P Shunt). He works as a trainer for the state DD Supports Division, which helps people access supports systems throughout the state and teaches advocacy skills as well. He lives at home with his mother. He has been a member of the league for 5 years. Recently, determined to walk, he practiced daily. This resulted in tremendous weight loss and a sense of control of himself and his life. Since he emancipated himself from the wheelchair, he lost a noticeable amount of weight. He walked the entire time with the Money Club and often told his story of how he no longer needs a wheel chair.

Robert was an enthusiastic participant and loyal supporter of his peers, staff, and myself. Robert always had a kind word or motivational message for anyone attempting to solve a problem - "Wow Helen! You are a real whiz at mathematics!" (1:01:00, Class 5) or "You did a wonderful job!" (1:14:52, Class 7). I cannot forget the time I brought in cupcakes left over from my son's 2nd birthday party and he was the first to thank me "Tell your son feliz cumpleaños! From me." (1:08:42, Class 5). He embodied the league's culture of helping others "We are here to help the people!" (3:20, Class 5) and always was there to make someone's day a little better. He often told me while I was teaching to 'not be nervous" and I would be "a great teacher" once my nerves wore off. I was comfortable teaching the class because of him.

Robert is a master storyteller, often spinning yarns from a ‘wise old sage’ perspective that often began with “One thing I know is...”, “As a reporter I know...”, “If there is one thing I learned is...” or “I will let you in on something...” Robert often stated clear and honest statements about how the world works and seemed to have really listened to the people raising him because a lot of the advice he gave reminded me of what my grandparents, aunts, and uncles would tell me – a lot of what is cultured wisdom. He stated these perceptions so often that sometimes when his opening few words began tumbling out of his mouth, a peer would feign drama and say, “Here we go again!” (16:50, Class 1). Truth be told, as the teacher watching the class, I got a sense that the class respected him, looked to him for support. They admired him and joked with him about telling them what to do. The class would not have been the same without a daily dose of Robert’s wisdom.

If there is one thing Robert remembered about school, it was one teacher he had back in Louisiana named Mrs. Xavier. He talked about her constantly and from her teaching, he learned to love mathematics. “I’ll let you in on something; when I was in middle school I learned mathematics!” He talked about how she was a taskmaster and motivated him to do his best. A lot of his statements about doing his best, having confidence, not being nervous, and not using a calculator came from her. He said “My teacher was strict, but I learned well from her.” His active participation in class can be credited to a teacher who 17 years ago, truly inspired him to work hard and believe in himself.

Even though his participation and activity levels never wavered, his confidence would vacillate from moment to moment. He went from rock bottom “I am not actually good at mathematics” (22:40, Class 2) to a little over seven minutes later stating proudly - “I am a

mathematics whiz!” (30:15, Class 2). Later in Class 3 his confidence completely turned in a matter of 2 minutes – right before I asked him to solve a mathematics problem “ I am afraid to get the wrong answer” (1:20:00, Class 4) and after he got it right, confidently - “That’s O.K., My mathematics skills come in handy from time to time”. Working with him was like riding a roller coaster in the beginning, although as the class went on I noticed more highs and fewer lows. It was as if I were watching an athlete catch stride and take off into the distance. By Class 7, Robert was in the zone “Mathematics is my thing, you know that” (1:56:40, Class 7) and by Class 11 he was handling one and two step algebra problems with ease. After solving a two-step algebra problem he said, “I don’t like to show off, but sometimes I have to” (6:00, Class 11). I noticed that as his skills improved his negative self-talk began to go away and the positive things he would say to others he began to say about himself.

The one thing that puzzled me about Robert was when he made wild conjectures about answers that seemed illogical. During our “price is right game” he would normally guess close to the cost of an object one would get at the store. Other times he would make a guess so far away from the price per pound that his peers would catcall about that making no sense. For example, during Class 4, I asked how much per pound bananas cost and he said \$12 per pound with conviction that he was right. Many people joked about that guess. Later in class, I asked him how old he is and he said he said he was 43. During another class, he said he was 33 (I found out he is actually 30 years old). After listening to the tapes, I still wonder what caused him to go from keeping good track of numbers for most of class to temporarily losing track of his age and the cost of a commonly purchased item at the store.

Robert was a great asset to the class. He kept the mood positive and supported every one there. I could not imagine the Money Club weathering the inherent frustrations of learning mathematics without an empowering influence like Robert. When he was not working hard, he was entertaining us with stories of his life, his past, and those who influenced him the most. I was lucky to see a student progress, keep his confidence and bravely solve problems that at times, were just beyond his skill level. By doing this, he was able to improve his abilities in mathematics and solve algebra problems.

Antonio. Antonio is a 22-year-old male with Autism. He is of Mexican descent and lives on the west side of the city. He currently is not employed and has been a member of the league for 1 year. His family takes care of him, they also seem to be protective of him as they pick him up and drop him off at Money Club each class. He is a fan of soccer and was rooting hard for Mexico during the month of June.

Antonio is a quiet and peaceful young man, the youngest in Money Club. He would attentively listen to the lessons and watch his classmates solve problems. He needed the teacher to call on him to answer problems, for he did not offer to solve problems without prompting. When his turn came around, he took his time to process the request. As a noticeable strain came across his face, he slowly but surely answered, and most of the time it would be correct. It took me a few classes to understand how he was solving problems – he was skip counting forward and backward to get an answer, checking and rechecking his answer before he said anything. There were times when his peers became frustrated and would answer for him. This set his clock back to start, and he began skip counting in his head

again, taking more time to solve the problem. I asked everyone to not interrupt his thinking. We looked at him and waited, sometimes for a minute or more for his answer.

Many people do not like to be looked at while solving problems, but I noticed that he needed to know that we were not giving up on him. If he thought I was going to give up on him he guessed at an answer and was close. For example, in Class 3 when asked what 6 times 3 is he quickly said “17” and then slipped into the background of the class. But when I kept at him and kept encouraging him, he did much more. When I asked him what 10 times 8 is he started counting backward out loud “10-9-8...” I said “No, Multiply.” He then began skip counting out loud “10-20-30-40-50-60-70-80” I said “right”. He smiled. (18:08, Class 3; p.23, design notes form) As time went on he began to trust that I was not going to cut him off while thinking or give in to him when he gave me a quick answer. He began to show me that he is a thorough problem solver if given the time. I noted “Antonio needs quiet coaxing to fight through his frustration with mathematics (He has stated that mathematics is his favorite, but I think he was just trying to make me happy) and he shuts down real fast.” (P.18, design notes form). An example of this was when in Class 7, during a pattern in mathematics exercise, I asked the class to tell me how many pieces of paper you would have if I folded the paper three times and made one cut. I waited for his answer, did not allow anyone to interrupt his thoughts, he guessed correctly that he would have 9 pieces (1:46:45, Class 7).

Once he trusted that the class would stick with him and his way of problem solving, he began to participate in everything we did. We found that he was a natural when it comes to guessing at prices of objects at the store often winning our “price is right” game. He had the closest guess on batteries and toothpaste (Class 3), as well as bananas (Class 4). Most

often he came in second or third. He could also visualize patterns in his head. For example, when I asked him to continue this pattern “15, 30 ...” He said “45” (1:32:45, Class 5). He also guessed correctly that there would be 5 strips of paper after folding a piece of paper once and cutting twice (1:42:07 Class 8). He became a clutch problem solver when it came to patterns and prices, impressing many of his classmates. He was fixated on learning how he could get a T.V. He was clear when I asked the group what they could save for he always said “A T.V.”(Class 1; Class 3) Robert in particular worked with him the most and was heard cheering for him on numerous occasions.

His thorough approach to solving problems and determined mindset became apparent after Class 3. He needed to trust that the class would be patient with him, especially me. He looked at me to see if I gave up on him and reacted accordingly. There was a risk that in class he might be passed over and allowed to become a wallflower. Many of the members of the group were used to answering for him until I stopped them. It was clear to me that he wanted to communicate and was even a little sensitive to others calling him quiet; but he became quieter if we treated him as if he did not want to talk. I documented this in the design notes form- “Antonio will look at you immediately for help and emotional support in a quiet way with a look of despair, and then smile at you when he is comfortable again often after answering a question correctly.” (p.13, design notes form)

An example of his perceived quietness occurred a few months after the Money Club ended when I visited the league for an awards dinner. All the members had been paired with an adult without a disability and completed a poster, which could be used to teach other people with a disability about a pressing issue in their lives. In Antonio’s group, two of his

peers dominated the presentation and the adult without a disability did not ask him to participate, so he stood there. When the adult without a disability described his team, he said that “Antonio is real quiet, doesn’t say much” and dismissed him. I sat there both shocked and angry that this person could assume Antonio had nothing to say. That evening I went home thinking that this is why he stays quiet, it keeps him safe.

His family is a big part of his life. They take care of him and make sure people do not do him harm. When I asked the class if anyone had been ripped off, only Antonio and Mindy stated that they had not. Antonio said plainly, “No I haven’t” (36:10, Class 6). His family provided transportation to and from money club for every class. He seemed very content with his living situation and wanted to do well in money club. I noticed and remarked that his actions toward me as a teacher and his family’s protection of him is similar to the way my family in California takes care of a relative who also has a DD. They push him to do well, take care of his unique needs, and then take every precaution to protect him from those in the community who may cause harm. They take care of the things that the federal government typically would do for a person with a DD, which includes alternatives to what SSI will offer an individual.

Antonio has the potential to be a valued employee who managers dream of: loyal, on time, works quietly without complaining, and works hard. His family, who dotes on him, will put him in a good position to be gainfully employed. I wonder if his mathematics skills will be honed and used in future employment, because they are not immediately apparent, and sometimes people who need time to process information are skipped over for the one with the quick answer.

Gary. Gary is a 27-year-old male with autism. He lives at home with his mother and runs a vending machine business. He is from an upper middle to upper class family. His mother is active in his pursuits and advocates for the league in the community and during the Legislative Finance Committee meetings in the capitol when they are in session. She is also a member of the board of the League. He has been a member of the League for four years.

Gary runs his own vending machine business, called Gary's Snack Attack. He bought a couple of vending machines that he set up around town with the help of a low interest start up loan, one of which is in the office building west of the 1st floor office suite the league occupies. Gary enjoys sorting, stocking, and handling the cash that the vending machines generate. The counting and keeping the machine filled helps with his sensory needs. He is very proud when someone mentions that he went over to the 'Snack Attack' to get something to eat from him. He is also attentive to customer needs, I remember the time he ran out of a soft drink and the next time I went to get a drink, it was full again.

He needed the freedom to pace and count and organize for a few minutes during instruction time or he became overwhelmed and then walked out of the room. If I gave him a few minutes here to release his energy within the classroom, it increased instruction time later. When he felt overwhelmed, he walked out of the room; he did not return for 15-20 minutes. When he paced in the room, he listened to everything that was going on in class, so when he came back to his seat he was also ready to learn again. If he left the room entirely I needed to re-teach the lesson taking more time away from the class. Making him sit in his seat was not only unbearable for him; it could in the long term, negatively impact a teacher's class.

Gary has a low frustration tolerance. He acts impulsively when he is feeling stress. He can begin by repeating words 3 or more times, then get up and pace or dance around the room repeating the same words repeatedly. Finally, he walks out of the room to get a drink or use the restroom. After working on a mathematics problem that caused him some anxiety, he thought back to a question I asked him 10 minutes earlier, which was “what do you want to save up for” and out of context began saying “A car, a car, I want a car today!” while walking around the room jumping up and down.(15:30, Class 2). I saw this action as a safety valve to let off steam and get rid of his building stress. He needed to work it out in order to return to tasks. In fact, in class, he rarely looked upset, just after a while, I could see on his face that he was building up anxiety and needed a release. I kept teaching the class while I attempted to redirect him back to work after a minute or two of release time.

Just as the impulsiveness relieved his stress, so did repetitive tasks. He looked forward to things like counting, pacing, sorting, stocking, and especially cleaning. In Class 2, I asked him how he is doing and he replied, “I feel good! Windows today, I like to clean!” (8:30, Class 3). He was already looking forward to his job cleaning and stocking the vending machine that afternoon. He also really enjoyed counting by ones. When he got a problem he would immediately begin counting starting with the number 1. For example in Class 1:

A: “Gary what is $7 + 5$ ”

G: “1,2,3,4,5,6,7,8,9,10,11,12. 12, right here!”

Sometimes he would only work on the first number I gave him and forget about the second. With multiple prompts, he could solve the problem, piecing or joining the unfinished counting on to the rest of the answer to form a whole.

A: "What is 10 plus 2?"

G: "1,2,3,4,5,6,7,8,9,10."

A: "then 1, 2?"

G: "1, 2."

A: no

G: "11, 12"

A: "very good!"

At first, I thought he could not join numbers without counting by ones, but after the third class, I realized that counting was a sensory activity and not a limitation for him. I asked him what eight times four was and he first reversed the numbers and said 48. I then asked him to count by fours and very quickly with assistance he was able to skip count to 32 without counting under his breath. (15:30, Class 3) After this class, I began to push him a little more each class with prompts, positive feedback, and gently telling him he would be able to do it. I had to be careful when prompting Gary too much, because this caused him to get up out of his seat and walk out the door or begin to pace around the classroom. I learned about his frustration levels and began to push him to the edge of his comfort zone and then retreat to cool him off before he got up and walked around. With each class I pushed him a little further, asked him a few more questions each turn until finally his tolerance for mathematics tipped in a positive way.

By Class 7, I really pushed him hard, I asked him to count to 250 by 50's. I kept refocusing him and giving him positive feedback while never giving him the answer. Robert even kept cheering him on from the sideline, "Don't be nervous Gary!" (50:30, Class 7). He

worked 5 minutes on this problem with the rest of the class focused on his continuing to count to 50 then counting by 50's to 250. When he was finished, a great big smile came across his face and the class cheered. I said "Gary had a hard problem and stuck with it!" Helen responded supportively, "He sure did!" (55:30, Class 7)

I wrote in the design notes form that evening,

"Gary has changed his demeanor toward me. He looks at me as if I matter. Before he would just say things, dance, run out of the room and not pay attention. Last class I focused on him, pushed him a little outside his comfort zone, relentlessly asked him to answer my questions then told him I was proud of him. I think it mattered to him. He is seen by many as a wild card, who does things erratically and that his intent can never be known. I am thinking that he, like many of us, is a deep, complex puzzle and that I have only scratched the surface of." (p.65, design notes form)

After going through my design notes forms, listening to the tapes, reading the transcriptions and coding everything I heard, I noticed that Gary worked very hard and made noticeable gains that I was not aware of while teaching him. It was only after going through the Data corpus that I realized that counting was a soothing activity and that he was not stuck there, he wanted to be there. He loved numbers and enjoyed the sheer act of counting each one repeatedly. A person like Gary could end up in accounting, or an inventory manager – he would make sure the store was fully stocked and not an item went unchecked.

Patrick. Patrick is a 22-year-old male who is affected by depression and has a DD. He is a student at a community college and has been a member of the League for one year. Initially, I thought I would never see Patrick after the first class. He looked subdued and

uninterested in the class. He was very quiet and would not volunteer much information in whole groups, but became more active when he worked in pairs. He had a purpose for attending the Money Club. He wanted to save money to buy a BMX bike and did not know much about finance. I found that as the class went on he began to interact with me more and I found him to be a fascinating individual who was going through tough times.

I also noticed that in class to get him involved I needed to strike a nerve in him with the initial questions to the class. I needed to break him out of a mental rut that can consume those with depression. I needed to find an idea that was so interesting that it propelled him to participate. I found that scams were the perfect trigger to get him involved in whole group activities. It turns out that he has strong feelings about credit cards, saying “Oh, no! I hate those things!” (8:20, Class 6) and scams, and has been taken advantage of financially in the past. “My SSI check was stolen from my mailbox! Someone broke into my mailbox and stole it and tried to cash it” (26:10, Class 6). These triggers were used to involve him and others in learning mathematics.

This initial emotional reaction to a past event got him in a place where his participation would spike and continue for the rest of class. Classes 6, 7, and 11 were high points for his whole group participation and they were directly related to credit card company rates and scams (Class 6, 7) and pawnshop mathematics (Class 10, 11). His example of a time his stepfather pawned his guitar became a clear mathematics model for understanding what happens when you pawn something. He was also much better at technology than I was, fixing the SMART board every time it went down.

Patrick had a firm grasp on adding and subtracting, but began to struggle with multiplication. I did not understand where he was making mistakes or why until we began division. On dividing, I thought Patrick had trouble understanding what dividing means, and after a lot of modeling, I wrote

I modeled chopping wholes into pieces using a karate chop on a stack of 6 blocks (it did not break evenly). I tried again and again and finally I showed them the right even split. I told them how to break up their stacks and put them to work. Patrick had difficulty understanding what divide was and what the groups were. It took a few attempts before he saw that the whole was divided 4 times into groups of two and that the answer was the group of two. (p.28, design notes form).

Once he saw that dividing was not some abstract word or process, but literally cutting up wholes into parts, his skills took off. He began looking at numbers and could cut them up in his head like a butcher.

Patrick was a great team member for Money Club. He wanted to behave well and do the right thing, which in his mind was to sit there attentively and not cause problems by talking too much. It took a lot of effort to get him involved in whole group activities and this may have been because he thought that what he was doing was what teachers want in class: being quiet, attentive, and compliant. Once his past came into play I could not keep him from participating and I was better able to understand what he knew.

Alejandro. Alejandro is a 24-year-old male with a DD in addition to serious mental health concerns. He was a sporadic member of the league and just moved to town from a southeastern city. He works at a consignment warehouse with his job coach. He likes to

spend his money at McDonald's and Wal-Mart. He did not interact with the other members of Money Club and felt that they were not nice to him. When other people told him that they do not hate him, he did not believe them and this triggered self-talk for up to a half hour. He sometimes solved problems by himself on a small dry erase board and sometimes he just filled the board with colors until I noticed him and then he erased it. Alejandro was the only member of the Money Club that I am not sure received any value from attending.

Alejandro lives with an undiagnosed mental health disorder, and within a few minutes of meeting him, I was reminded of my three years working for a psychiatric hospital. He perseverated on an idea and said that idea or phrase repeatedly to himself. For example, he interrupted class often with this "Quon Chi, Quon Chi, Who said that?... yeah, I said that." (9:20, Class 1) and "Quon Chi is going to kill everyone, he's crazy." (35:08, Class 1) [I later found out that Quon Chi, a character from the video game Mortal Kombat, is 6 feet 7 inches tall and weighs 210 pounds and is known as being both "Ruthless and pragmatic"; he dresses in black and has a bald head. He is known as an evil character (Wikia, 2011)]. Alejandro temporarily returned to solving problems or sitting at his seat quietly. He mumbled things that were indecipherable for many minutes to himself as well (58:00, Class 6) or repeated a word that focuses the groups' attention on him with no provocation "Shameless, Shameless, Shameless..." (41:00, Class 1). He also enjoyed sitting next to one of the four tape recorders I set up around the room, so he could talk directly into it.

He spoke often about self-harm, often getting very mad at himself, seemingly unprovoked. He was sensitive to others feelings and mirrored and absorbed how they felt and inverted the angry feeling toward himself and said things like, "Anthony, I'm not crazy, but if

I get mad I am going to hit myself!” (1:25:21, Class 6), after a negative reaction from another member. This was stated directly after Wes shared a story about the security personnel at Central Community College not doing anything after his wheelchair was flipped by students. I noticed that when others were upset about something Alejandro began to act out and talked about wanting to hurt himself. When this happened, I deescalated him and told him he was going to be safe in class. It did worry me with some of the talks he had with himself, that he may need more psychiatric care than he was receiving, For example he began speaking to himself alone at a table in the room “Do it man, Don’t mess with me! Don’t. You. Argue. with me! Do...not. Do...not! Do ...not.” (59:20, Class 1).

Alejandro despite all the issues that he is dealing with was very aware of his surroundings and listened to everything that was happening in the classroom. For instance, during a moment when he was talking to himself, one of the staff at the league was telling Gary to “listen to Andy.” Alejandro stopped mumbling and with absolute clarity said, “His name is Anthony.” Then went back to mumbling, (33:20, Class 1). A few minutes later when he solved a problem correctly he said, “I am smart. I am not crazy!” (36:30, Class 1). He acutely knows what others think about him and every now and then would remind people that he is an intelligent person who is trying to not be crazy. He knows something is wrong with him, he just does not know what to do about it.

He is worried about not having enough food. After I handed out snacks to people at our mid class break he waited until I passed him and went back to take a few more of the snacks, while I was not looking. I began just giving him as much as he wanted to alleviate his feeling of guilt for stealing. This worked until the 10th class when I asked him if he

wanted seconds. He said, “No thanks.” Later, when I listened to the tapes he could be heard talking quietly to the tape recorder saying “Why would I, I took two already.” A few minutes later he got mad, said the class hated him, and shut the tape recorder off.

I am still not sure if Alejandro learned anything or benefitted from the Money Club. He mainly sat alone, did not want to work with others and talked to the tape recorder. When he did participate, it was an inappropriate and barely tangential response to someone else’s idea or feeling. I worry that he is not getting the proper medical care. He is the one person at the league whom I feel I could have helped more. I just felt that every day went by so fast and I was trying to maintain myself and keep him as included as possible; but he did not want to work with others and with an inclusive classroom, everyone must cooperate and abide and he did not.

Ontological Innovations: Theory Building

In this section, I will be developing theory grounded in the procedures of a design experiment where the daily habits, teachings and trial and error lead to new understandings, which can improve teaching. I will discuss how my own theoretical development ran parallel to the data collection of the Money Club. I will be explaining how the design notes form charted the course of my 6 week teaching cycle. I will detail each class and how one class impacted another. Finally, I will compare the design experiment in teaching to a grounded improvisation or a live high wire act without much of a net. I learned how the simple act of habitually chronicling your teaching could have a big impact on teacher skill.

Theoretical development runs parallel to data collection. *In the beginning.*

During classes one through four, I focused on the basics in this order: addition, subtraction,

multiplication, and division. After the first lesson, I focused on one and only one operation per day, briefly processing the previous lesson as a familiar tie down point to work from. I used these four days to build foundation, assess what they knew and did not know, as well as to get the groups to work together and build team skills. Each night I planned supports and tried to better understand the people I was working with. I took extensive notes on what people were struggling with and how best to clear a path toward learning. By the third class, I was gaining clarity on who needed what and how to teach more effectively for future classes.

For example:

“Alejandro, Matt, Robert, Helen, Antonio, and Gary need concrete direct instruction with manipulatives to understand the concepts. Gary also needed a lot of processing and redirection back to the group. Mindy and Amy needed bridging (taking their prior knowledge and connecting it to our classroom learning) and the best way to bridge with them was through argument. Stan, Patrick, and Shirley needed more challenging curriculum, although multiplication may be their present ceiling.”

(Lesson plan 3 adapted from design notes form).

During the first class, I started with a card counting game to join the two or more numbers I dealt from the deck to work on addition. I also probed extensively for understandings and opinions about mathematics and what they wanted most to learn about. I learned about where they worked, what they did, and how they spent money. It was a very active class; the participants were nervous because the newspaper writer and photographers at the city paper showed up and took pictures. Alejandro told the reporter, “I don’t like you, I get mad” (58:20, Class 1) as she passed by his table. The students were also leery about doing

mathematics operations and I needed to reassure them throughout the class that mathematics is nothing to be afraid of. We finished with a “the Price is Right” game during snack where they all guessed on how much each item cost, and I would try to give them mathematics problems applied to the snack costs to solve while they ate. We did this every class onward.

Coming back for the second class was frightening. I was worried that I would show up and crickets would chirp, and the league would be empty. I did bring snack and found that the slogan “Come for the snack; Stay for the mathematics” may have been the most successful idea I had all summer. We worked on subtraction problems and visualizing what is $\frac{1}{2}$ of an object using the model of the now famous *Arnold Palmer* drink mixture of ice tea and lemonade. I wanted them to see the half of something so I could further work on this concept later with other fractions. I took guesses and we worked through ways in which you could find the right answer. Fractions scare people and I wanted to ease into work in this area. We also talked about saving for future purchases and delayed gratification.

The third class worked on how to be cheap and make your money go far. We compared the prices of different types of stores (Costco, Smiths, and 7-Eleven). It was shocking, even to me, of how with most of the basic things we buy everyday how we would pay three times as much at 7-Eleven as at Costco, just for the convenience. We learned multiplication in card counting and learned basic linear algebra applied to buying coffee. By learning linear algebra, we found that we could save \$50 per month by brewing our own coffee over a span of weeks. Amy at first did not want to guess at prices, so I kept calling on her and then told her, “It is ok to guess.” She replied “I got chewed out for guessing, you have to think with your brain.” I then said “Is guessing thinking...yes! So Guess!” (1:23:06, Class

3) and she did. We discussed how price is directly related to convenience. As the time it takes for a person to get in and out of a store increases, the price decreases. 7-Eleven is great for a fast transaction, but a customer will pay three times as much to get the same item as at Costco

During the fourth class, we composed and decomposed numbers to teach division and review multiplication, connecting the two using a Mathematics triangle (see Figure 2). The sum is on one vertex and the two numbers when combined are on the two vertices opposite the sum. You can work out both operations and demonstrate that they are the same. We also folded a piece of paper multiple times and guessed how many boxes we were making. Wes and Lynne worked in a group and were so focused that they continued to fold and guess how many boxes throughout the class after we moved on to something else, and during snack break.

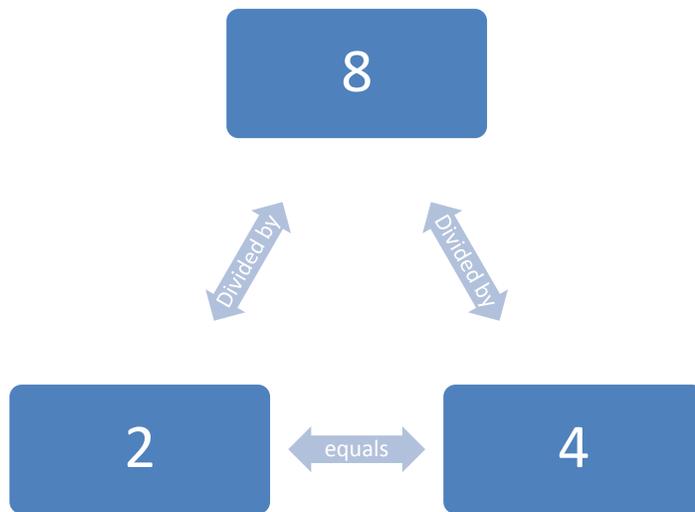


Figure 2. Example of Mathematics Triangle

In the middle. The multiple gears of Money Club began to engage and I noticed a driving force pushing each class forward from Class 5-8. The members developed good working habits; learned how to be good team leaders and members from their peers, and were able to solve basic algebra problems in small and whole groups. We also had two aggressive episodes, one disruptive argument between peers and one from a visitor to the league, which frightened a few of the members. We were able to deal with these two episodes because we had formed a great working relationship during the first four classes. If these incidents had happened in the beginning classes, I would have lost many participants.

Class 5 began with a lesson on the evils of credit cards using fractions and linear algebra to demonstrate how companies rake in shopping bags full of cash off people's purchases. We started with free throw shots using 5 gallon buckets and crumpled up pieces of paper to find shooting percentage, then learned ratio using nonstandard measures: How many of your feet, hands, and forearms equals your height; what is the ratio of wingspan to height. We then folded paper into $\frac{1}{2}$'s, $\frac{1}{4}$ 'ths, and $\frac{1}{8}$ 'ths to use as a table to write in the numbers, when, for example I want $\frac{1}{4}$ 'th of 60 they would write in 15 in each box. Then I could ask the participants what $\frac{1}{2}$ and $\frac{3}{4}$ 'th of 60 is and they would count boxes to get the answer (this proved to be a valuable support). We finished with a snack of my son's leftover 2nd birthday cupcakes, which gave us an opportunity to both divide the cupcakes into fractional pieces, but also talk about the law of diminishing returns related to how many cupcakes they ate and the happiness they derived from it. By the fourth cupcake, we no longer enjoyed eating. "She would be puking by then," Robert said.

Class 6 was scheduled right before Fourth of July weekend and I was concerned with team focus and attendance. I was also concerned with a confrontation that occurred between two students the class before, when Rex yelled at Amy for talking because he was having difficulty concentrating. I planned a group meeting to process expectations and to make sure the class understood that these things happen and we will learn how to be better group members because of it. They were shaken up by the outburst and needed to meet to come back together. We then started researching credit card rates and fees online. We compared and contrasted different rates that they would receive at different credit scores. We also looked at watchdog groups websites and I showed them where to go if they got into credit card trouble. We modeled linear equations as a whole group to find ATM charges and overage charges.

I noticed that by class seven my belief in their abilities was increasing, I saw this in the comments in the design notes form and in the accommodations portions of the lesson plan. I was frustrated that I did not notice certain abilities prior to Class 7, for example:

I need to explain what I am doing in a clear and concrete way, while keeping the tone of the class calm. Things went real well today, Gary needs concrete support during the entire lesson. Antonio and Robert need guided practice and a lot of sideline coaching to get their heads in the right place to solve the problem.

The blocks helped during card counting, especially for Gary who could, after looking at a stack of blocks, find the midpoint and chop it in half. I had to give him clues to finding middle and string him along with Zone of Proximal Development, (ZPD) type supports. Praise and constant attention to their solving of problems helped

them continue to work on problems. I would ask follow up questions after they found one answer, so each person in the card counting exercise would have to solve up to 4 problems for each number ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$ and a follow up question on why).

I also need to “slow down to speed up” class learning, in other words I need to drive the concept longer and give solid examples for the group so they get a firm hold of the mathematics. Once they are clear in what we are doing, the learning will speed up and become firmly implanted in their minds. I will continue to calmly begin the class and take a lot of time in the beginning about what we are doing, how to do it and do a lot of guided practice. They absolutely are capable of learning what I want them to learn and have a lot of history or prior knowledge to tap into. (Lesson plan 7)

We started by comparing the costs to features of (a) an IPOD touch 16G for \$250 and an IPOD Classic 160G for \$225. Then we solved and graphed in small groups how long (X) amount saved per week it would take to pay for either device outright, without using their credit cards. It became an opportunity to push the students outside their comfort zone and have peers encourage and push others to continue to solve the problem repeatedly until they found out the number of weeks necessary to reach their goal. Gary was especially diligent in sticking with the problem, staying ‘on the hot seat’ for more than 5 minutes without walking out of the room. We used 5, 10, 15, 20, 25, and 50 as (X) to graph each number of weeks and watch how the slope increased with more money saved per week.

The class finished with an exercise on algebraic expressions, patterns, and conjectures. We (a) folded the paper once and cut once, then twice and cut once, and finally three times and cut once, then (b) folded the paper twice and cut once, then twice, and three

times; each time guessing how many pieces we would make, then counting them. We talked about how we came up with answers and what the expression would be to find the next amount of paper. It was a challenging exercise, but as a group, they could do it. At one point, I mentioned “We have great guessers or in mathematics we call it conjectures.” Robert replied, “Wow! Mathematics is my thing you know” (1:45:00 – 1:55:00, design notes form Class 7).

Class 8 commenced with a fun activity called “Mindy goes to Hawaii” where the group worked out different ways for her to realize her goal of going there. We then compared different savings rates, ways to save on the trip, and when to go. When Eddie came by to check out the club (Class 8), Helen’s face went pale and her head began to shake back and forth. Then Eddie paced the classroom, almost stalking it and the whole class went silent. He would sit at a chair, then get up, go into the lobby and stare at the class, then go out the door, turn around and open the door just a crack to stare at the club again. He would continue to lurk around at different desks, where his behavior was beginning to bother me. I looked over to Helen and I asked her if she was ok and she said sternly “I do not like him, I shared my French fries with him and then he took all of them.” (Class 8, after he shut off cassette tape). Eddie later took the tape cassettes on the desks and shut them off. I began to tell him that he could not touch my property and reminded him of the rules. He became agitated and walked out never to return. This was a good test of our groups’ trust that I would keep the members safe.

Helen knew him and went completely silent and began shaking, I asked her what was wrong and she said “He is mean.” It became apparent that he knew his effect on the group

and would sit at one table, bother them, then move on to the next, and then disappear in the door frame in the front of the league only to return to his paces. For example,

I also had to redirect and lay down very clear directions to a new person in group today, Eddie. I had not seen Eddie around the league before today. He showed up late and would situate himself in the corners of the room or propped between the door, half in the hallway and half in the league. When I invited him into a group, he said he was “just watching today.” When he did sit down he came to a right corner table by himself and began calling out a few answers to problems that I wanted others to solve. I began to sense bad things were going to happen. I asked him to raise his hand if he wanted to answer questions and he gave me a look of sarcasm and then when I looked right back at him he put his head down and sulked, every once in a while would look up at me with a sarcastic face. I ignored him and continued thinking as long as he is following my directions he can look at me like that all day. (p. 61, design notes form)

Eddie would enter the room again furtively, then make a direct line and sit on the tables. I had to redirect him often and reinforce rules. Then he picked up my tape recorders and turned them off one by one. When I realized what was happening, I told him, “You do not touch my stuff or anyone else’s, you can leave now!” I chronicled the event in the design notes form, taken from the tape

During clean up time the entire class walked up to me. Then, while I was helping out another group I started hearing voices on a tape recorder and my head shot up, I gave him a clear look and asked him what he was doing (which was a stupid question since

I knew exactly what he was doing, he was erasing the tape), then told him to put it down and to not ever pick up something that is not his. I think I scared him, he jumped back and then I told him to sit down in a seat (he was still sitting on the table). He sat down then a few minutes later got up and said he did not mean to do it and walked out. I was furious, but did not raise my voice much and just continued with the lesson. (p.62, design notes form)

I did not like how I told him to leave and was concerned with the reaction of the class, but I went back to teaching. After class was over and I was cleaning up I had an opportunity to see the character of the people in the group, the inherent kindness with what they treat people.

They all looked like they wanted to comfort me or for me to let them know the class is safe again. I think that when I directed Eddie firmly it scared them a little. I also think that they all know Eddie and that he is a bully. Helen told me that when Eddie walked in she 'blacked out' and that he bothers her and yesterday that he stole her French fries at Mc Donald's. Helen said that she offered him a few fries and then he took all of them. Mark said he is a strange guy who acts that way all the time. This gathering around me reminds me of times in my own classroom when someone acts out of control and gets reprimanded – they want to let me know they are supporting me and want me to tell them that things will be ok and the class will be safe again. (p.62, design notes form)

The final classes. During Class 9, we bounced back as a unit and worked very productively the entire class. Most of the best personal statements about learning, what

makes a great teacher, and dispositions toward mathematics came out of this class. It may have been the best overall class. It started with me telling them that we would be doing algebra today (even though we were doing it earlier, I felt they were ready for the weight of the term). Robert sighed “Oh boy.” echoing what the rest of the class felt. I told them, “What if you never tried pizza and I tell you we will try pizza today and you said gross and you never tried it ever. How would your life be?” Robert replied “Not that great.” Then we went on to talk about toughness and how when we go after tough things it makes us better. We slowly worked on one-step algebra equations solving for (X) for addition, subtraction, multiplication, and division. When they began to get correct answers, all of the members started to be excited, because they overcame their self-constructed barriers, which stated that algebra was beyond their abilities. It was exciting to watch when we did whole group work on the front board and everyone came up to the board to work.

During Class 10 a second individual came by class to attempt to disrupt our money club, but was sent packing and we quickly moved on to learn about the concept of algebra as bone setting. I brought in paint stirrers from Casa de Martillos and Wes volunteered to demonstrate how to break them all with his karate skills “I don’t like to show off, but in this case I have to!” (6:18, Class 10).

I used the original meaning of the word *Alg-jabr* (*Arabic*) or the restoration skill in algebra, or Algebrista, which can be translated into the words “bone setter” also a restoring of what was before. I wanted them to understand that algebra can restore broken problems and that the act of breaking a whole stick and restoring it back together is an algebraic act. After Robert demonstrated his way of breaking up the paint stirrer with his karate skills, they all

broke their sticks into two pieces. I took one of the pieces and left them with the other. I then mixed them up and left them in a pile on the desk.

I told them to find their missing pieces and restore the sticks. We then talked at length of how each person worked on getting the right piece. I modeled how if I am standing with a stick 30 cm long and the original stick was 52 cm long, how long would the missing stick need to be? We figured it out using subtraction to say the piece I am looking for must be 22 cm long. The members began to tell me how they found their pieces: lining up the points on the broken piece, measuring the piece they have and looking for the missing piece using subtraction.

Then my second individual showed up, Tracy, who had not been to a single Money Club class and had been known to disrupt, aggravate, and annoy the members of the league, but because it was a drop-in club, I welcomed her in and offered her a seat. She flippantly said “I am late, you need to catch me up, so catch me up, I missed a lot” (23:18, Class 10). I told her that she could listen for a while so she knew what we were doing and then she could participate when she was ready. She became angry, which I attributed to her inability to get me to pay her my full attention and later to control the class. Here is an excerpt from my design notes form, documenting the 22-minute interaction.

She then continued to ask questions and started to get others involved in her issues.

Robert told her “Don’t worry Tracy everything is fine”. She kept asking questions and I stopped looked right at her and told her that we have rules and one of them is raising our hands so we do not all talk at the same time. She then said “Stop treating me like a little kid.” Which I am sure she has said before and gotten a great reaction to, so I

ignored her. She then asked more questions without raising her hand and I told her no more questions, we must move on.

Others were asking questions and I attended to them, which she could not handle so she followed my directions and raised her hand while at the same time yelled “I am raising my hand” so I called on her and she answered a mathematics question correctly, for that I complimented her and let her know that is the way we do things in the club. I then called on a few other people. In the background, I could hear Tracy, who repeated over and over again “why are you treating me like a little kid” which I ignored three times. Then I asked Helen about the Sunday paper, which featured the league and the advocates, and Tracy jumps in “what about the paper” I ignored her – then she says to Wes “He is talking to me like a little kid” and Wes says to her “We do things one at a time, we take turns, it’s ok Tracy.” to calm her down.

This works for a minute, then she begins to interrupt the group and starts to talk to Patrick. Then she began to talk to Robert. Meanwhile, I was teaching about the algebra in the paint stirrer activity and asking the group questions. Tracy kept mumbling to others in the group. Then she raised her hand and asked “what is with this tape recorder” I answered her question, then immediately after asked “Why do we have to raise our hand?” Robert said “it is proper etiquette” and she continued and I stopped her with “We follow the rules here, you do not have to be here, we have not had any problems except for that one person who steals French fries, and so if you want to be here you have to follow the rules. (pp.79-80, design notes form)

As she left the class she said a few more threats to me about calling her caseworker and Destiny, I ignored these comments and kept teaching the class. Then she left and I thought she would be gone for good only to hear the door open five minutes later.

Therefore, after five minutes of relative calm passed, Tracy concluded at the 45th minute about the class and said “I do not think this will work out between me and you!” I thought this was very mature of her to say so I said “I agree with you it won’t” Then she said “I raised my hand like you wanted me to...” I cut her off because now I changed my mind and began to think that her first response really was not to share an epiphany but to bait me again so I said “I agreed with you, the way things are going it will not work.” Then she came back with “I do not think me and you are a good match.” I said again “I agree” then pleaded “I want to talk to Destiny!” Then I explained where Destiny was and if she would like she could wait in the foyer until she returns. Then she kept talking while leaving and I mainly ignored her until at minute 47 she was gone. (p.81, design notes form)

Then she was gone; like a dust devil whipping the class into an anxiety provoking frenzy, she had come and gone. The class looked frazzled. Mindy and Amy kept asking me if I was O.K., thoughtful but also self-examining, wondering if they were O.K. too. Helen, Lynne, Wes, and Antonio looked worried. Robert remained unfazed.

Whenever I have had a blowout in my regular classroom, as long as I am calm, respectful, and hold my ground the class does not stay disrupted for long. If I bring myself to the level of the aggressor, it takes much longer to heal the wounds that these tense moments tear at. When I looked at the faces of the class I knew I did the right thing; they looked

relieved and thankful that I did not allow her to wreck the class. I did not treat her abusively, which is sometimes the result of aggression, because a person wants it to end as soon as possible. I withstood the barrage for 22 minutes and came out a little worn, but well in the eyes of the members. I was very relieved and moved.

I continued to keep the class moving and did not let this throw us off course. We worked out some simple interest problems on Wes' \$2,000 in his bank account and that to be safe he should only have \$1,900 so the interest will not suddenly go over \$2,000, resulting in loss of benefits. Soon snack time saved me from losing the class, giving me a chance to regroup and talk to the group informally letting them know I am the same person as before Tracy disrupted the classroom.

During the second half of class, each member seemed to listen closer to my teaching, as if they did not want to be categorized like Tracy. It was fortuitous, because they needed to learn the two step algebra, requiring a great deal of concentration, conceptualized as tying and untying of knots – forward to tie and backward through the steps to untie. They worked diligently and Wes, Lynne and Helen could do the operations without help by the end of class. The others were willing participants and tried out each problem.

During clean up Helen let me know that Tracy was fired up and driven to disrupt prior to class. On the bus ride over she kept asking her, “Who is Anthony?” “Why do I have to be in the Money Club?” “What is the Money Club anyway?” Tracy said she was upset because someone told her she had to attend. Unknown to me she was already agitated prior to walking through the door to Money Club and I should be glad it did not go worse for me than it did. This was the last interruption of the class and with no lasting damage.

During every class we had many distractions, people coming and going to do business at the league, parents and other advocates showing up for meetings; and off topic conversations. Some of these off topic conversations turned into very productive learning opportunities. During Class 3 out of the blue Lynne said, “Four guys and a girl jumped me!” (1:37:31, Class 3) which spurred a conversation on how to be safe in the community and the tips they have learned in the past including: When scared duck into a store; never pull your wallet out in the street; watch out for “bumping and pick pocketing;” and never look up (look ahead). As a teacher, when I engage and accept off topic conversation I am taking a larger gamble than normal on productive learning – when I allow the side conversations and it turns into a mathematics lesson I hit the jackpot. When it causes pure distraction, I may lose the class for a few minutes and it will take a lot of energy to get them back.

Themes of Money Club

Prior to the study, I developed interview questions that might address possible themes of the Money Club. I called them hypothesized themes based on my prior knowledge of working with students K-12 with DD. Although the questions uncovered valuable information, they did not adequately answer the hypothesized themes I originally conjectured. After analyzing the data corpus, the themes you will read next emerged from the data through the constant comparison method (Glaser & Strauss, 1967).

Analysis of data. In order to discover the final themes of the study, I developed a coding matrix (see appendix E) of possible themes and sub themes that I thought I should study further after listening to the tapes and transcribing relevant information from classes 1 – 12. Informed by a previous listening, I created multiple nets (coding categories) to catch data

for use later. I listened to a few of the classes and began to collapse certain matrices and expand others, estimating which would be the most beneficial to the study and to increase construct validity. In total, I used four different coding sheets before deciding on one to use on December 20, 2010. I spent the next two months listening to the taped class sessions and coding data, before developing an outline for framing this dissertation. The themes below emerged from this final coding matrix, see Appendix E, as well as vignettes taken from class sessions, which are documented, by class and time. The final matrix cut was: (1) Problem Solving, (2) Money Habits, (3) Scams, and (4) Empowerment. Using these four main themes I understood what was happening in the Money Club and could see what each individual was saying and doing with a clearer perspective. In the following paragraphs, I explain in detail how each theme originated and its meaning to this dissertation.

Theme One: Problem solving. *Invented strategies vs. standard algorithm.* The members of the Money Club used both invented strategies and standard algorithms that have been used in school for some time now. I found that as participants' confidence increased they began to take risks and use invented strategies to solve problems (or they began to talk about it) (1:36:00 – 1:56:00, Class 7; p. 45 design notes form). When they made mistakes or felt embarrassed for making a mistake, they would retreat to what was safe and start using standard algorithms again. For example during Class 6, Lynne, who proved to be a great inventor of strategies, would return to use the standard division algorithm when she became nervous:

Lynne goes straight to the long division algorithm and will work it out with pencil and paper (she also doubts her answer the most and thinks she is guessing, like she

crunched a number through a machine and is still not sure if the answer is reasonable, where the ones who just split it in their head (Wes, Antonio) are certain of their answer. (P.51, design notes form)

Some would even retreat back to counting on their fingers, our most concrete way of understanding mathematics to make sure they did not make the same mistake twice.

Their confidence in mathematics sprang from two places: (a) The groups' unconditional acceptance of them within the safety of the environment set up by the League, as well as (b) multiple successful attempts at solving a problem in small or whole groups. I found that solving multiple problems 1:1 with teacher increased their confidence only enough to use the standard algorithm within small and whole groups; but could not take the step forward into the abyss of inventing a way to solve a set of problems (Class 2; p.13, design notes form). They needed a full head of steam on a small or whole group stage, or solid consistently paced instruction to get over their fears enough to go after a problem in their own way and be able to explain how and why they got there.

Peer models with disabilities. There are many examples in the research literature of peer models working with students who struggle to learn, one in particular focuses on the difference between tutoring and just repeating information (Roscoe & Chi, 2007). The tutoring problem arose out of the more skilled peer just repeating information to keep the one struggling with the rest of the class. The actions of the peer models with a disability in the Money Club, addressed some of the concerns of this study. Individuals with DD were peer models for others with similar disability on learning mathematics is in fact a new avenue of study. In the research literature on peer models it is the student without disabilities who is the

designated mentor (Carter et al., 2005). In this study, I found many peer models with disability: One developed immediately (Helen) and two more developed and became consistent contributors during the second half of classes (Lynne and Wes). The significance of this is similar to the struggles of many minorities, of which people with disabilities are members, that the one in power is not necessarily the one who can help them the most. One who understands what they are going through may be their best teacher and leaders. They lived through it, learned how to overcome the disability, and may have the keys to help others unlock their potential.

While many articles exclusively focus on a peer model being a peer without a disability, I did find one article that focused on a peer model with DD. In Roberts (2007), an 11th grade student with Spina Bifida taught self-determination skills to another 5th grade student with same disability. The results of this study were that the 5th grade student increased progress toward IEP goals by 75%. The significance of this study to my own is that when a peer with similar disability increases the outcomes for the student, it is a worthy vein of research to continue work in. I found other articles that focused on video modeling of a person with a disability imitating a peer model (Ogilvie, 2011; Bellini, Akullian, & Hopf, 2007), which is similar to the research on one or more peer models without disability (Carter, Cushing, Clark, & Kennedy, 2005). I contend that if the peer with similar disability has learned the skills to be a role model it is the best teacher-learner situation for the reasons I specify later.

I saw my job as a learner, because I wanted to see how the participants got the best out of their groups and I would wait until asked to help them teach a concept. I saw natural

teachers develop through experiencing what it was like to work through a problem with a peer who may be struggling with similar barriers as they did or still do. I respected their ability to teach others and that alone gave them reason to ask me for help when needed. We had great trust within the class. They learned that I was not going to micro-manage the groups. I was there to help as needed and really was excited to see their groups being led without me and I let them know it.

Helen, Lynne, and Wes seemed to know innately when to push and when to step back and give their peers space (pp.9, 23, 27, 51, design notes form). This is an advanced skill that student teachers struggle with in practicum; however, these three peers were proficient after the fifth class. I was astounded with their ability to push the students until they were about to give up, then praise them, encourage them, and step back and give space, which was followed by pushing them again. Most teachers still struggle with this, three to five years into teaching. They end up causing the student to shut down or worse will ignore them and not expect their best. The club members had a clear advantage of having access to teaching peers with similar disabilities than peer models without a disability which is the case in both research literature and in practice in schools today, who may give answers or do too much of the heavy lifting for the person with a disability.

From Class 6 onward, I began documenting how important leaving the heavy lifting to the individual was for learning mathematics (p.54, design notes form). I began to see that the peer model with a disability, in this case Helen, was able to see very clearly what was possible for the individual and what modifications were necessary to complete a task. For example, she saw that with Robert, he could not hold or cut with scissors, due to his physical

impairment, but could fold the paper independently. Using scissors and folding paper are both fine motor skills, yet one is at the edge of his abilities and the other will end up with him possibly cutting himself. She saw that difference and pushed him to that edge while keeping him safe, resulting in Robert realizing his potential (1:40:46, Class 7).

Supports. Specialized supports for people with DD can close the gap between understanding and performance in mathematics by bridging the spaces between splinter skills, or many isolated skills without attachment to a context. Specialized supports in this study will be defined as teacher driven, peer driven, conceptual, visual, concrete, and auditory supports that reinforce and strengthen the understanding and skills in mathematics. When referring to the terms ‘reinforce and strengthen’ – supports are not crutches or band aids - items which temporarily help a person solve a problem but over time limit and weaken the individual due to overdependence. Each support is seen as temporary, slowly moving the student toward independence and moving toward other less restrictive supports.

A learner may have partial understanding of a mathematics problem and get stuck. After a while the learner gives up. Specialized supports that allow learners to keep and continue with their momentum in solving a problem can be the difference between success and failure. The general progression should be from teacher supports to peer supports and from concrete manipulative supports to mathematics models (visual and auditory) toward a conceptual understanding as a support for solving problems based on the results of Money Club and my own practice of teaching mathematics.

Teacher driven direct instruction is a primary mode of teaching in many self-contained classrooms in the schools I have attended and worked at. The teacher will see

students struggling with a problem, walk over and model the answer for them. Each time the teacher will help them in a one to one setting, getting their complete attention so that they can get going in their work. I found that one to one direct instruction was helpful only in small doses – as jumpstarts. When students were struggling in a group, I would walk over, ask them where they were getting stuck, quietly break them through the barrier, and then quickly walk to the next group. I walked away quickly to avoid a common pitfall in instruction – the longer I worked with a student one to one the less effective I became and the more time was expected from me in a one to one setting, this also takes time away from other students. The longer I stayed, the more dependent the student became; eventually reaching a point where all students believing they could only solve the problem with you around (p.12, design notes form; Class 2). I found that this short jumpstart could get them back into their group and move them toward the second support, the peer with a disability.

In the Money Club, I found that many peers within the class, all having a DD, were great role models, beginning in Class 2, the number of peer models increased (design notes form, taped class sessions). They were especially adept at finding where individuals were getting stuck, and working with those individuals to find the proper way of solving the problem without giving them the answer. I saw them time and time again place the weight of learning on the struggling participants to work through the problem, while cheering them on with a lot of praise. The struggling participant kept at it with these individuals and often times solved the problems correctly. An example of this was when Helen, our first peer model, discussed how she helped others. I watched her work with Gary for a few minutes - holding her own and never giving him answers. I said, “Great job, the great part of you being

the leader is that you are nice to them but you never gave them the answers,” Helen responded, “That would be cheating!” (34:36, Class 7). She took pride in the fact that she was a good teacher and would never think of giving away answers to anyone.

I found the peer model with a disability to be better than peer models that do not have a disability in the areas of placing the responsibility of learning on the individual struggling; helping just enough to help but not too much to build dependence; and empowering the individual through appropriate praise and feedback (p.67, design notes form). Many times in my practice as a teacher or supervisor of teachers, I have witnessed peers who do not have a disability, with the best of intentions, wanting so much for the individuals with a disability to succeed, that they will help so much that the individuals either do not have to work as hard as they could, or worse; they take over the group to the point where the individuals are doing nothing other than enjoying a social encounter with others. The peer without a disability is often not aware that their ‘help’ is debilitating and notes the encounter as positive and helpful. I documented this on p.54, in the design notes form, stating

I think that everyone wants to work hard and feel like they are doing the work and that too often teachers, especially those who teach this population, in an effort to protect them, do not expose them to challenges and the subsequent wrong answers, struggles, and failures that come with any success. They want to jump in the moment a student gets frustrated, because they could melt down and give up on learning; but if you jump in and bail them out they are learning that they do not have to try and someone will bail them out each time, which they do.

The peer models in the Money Club never felt the need to intervene prematurely, because they knew they could do it themselves.

Helen, Lynne and Wes became ‘clutch’ peer models whom I placed strategically in groups with others, knowing they would work them as hard as or harder than I would. Often, I would listen to groups and sit in awe of the natural teaching instincts and strategies of the peer model expertly extracting answers and participation out of struggling learners. Much of the success of the Money Club was found in groups facilitated by these three peers, all in their 40s, working with the rest of the group. If I had to pick one major support that transformed the club, it was the initial emergence of Helen, followed a few classes later by Lynne and Wes as peer models.

One other system that was particularly effective with the Club was the continuum of supports provided for participants by first teaching with concrete mathematics models and eventually moving toward more abstract models as individuals became more secure in their skills and abilities. Each lesson started out with a concrete model for example that would set the concept firmly in place before moving on. For example, during a basic algebra lesson on breaking and rejoining in 1 step linear algebra, I brought in paint stirrers and asked them to break the stirrer, Robert modeled with his karate skills and then we all mixed a piece up in a pile (p.71, design notes form). They had to find the missing piece and rejoin the whole part. Afterward, I drove the concept further and we talked about other things that are broken and need to be pieced together and we talked about CSI investigations as well (44:00, Class 10).

The continued conversation in a whole group on the concept of breaking and rejoining allowed for visual and auditory processing of the specific concept, which improved recall

later when the members had to work in groups. It also gave the individuals a chance to show their skills with a larger audience. I noticed the grand classroom stage, or the front of the room in the Center, to be a motivator for Wes, Robert, Lynne and Patrick especially (42:51, Class 10). Patrick responded after correctly solving his problem “I just figured out the piece by looking”. It took a lot of gumption to participate for Patrick. Once they got over the awkwardness of speaking in front of the group many members found this part of the class to be enjoyable, (See their comments in Table 2.)

Table 2

How each participant found the missing pieces after breaking paint stirrer in three places.

How they found the missing pieces	Participant
“ I fit them together”	Amy
“I added them together”	Lynne
“I used subtraction, actually”	Wes
“I used my mathematics skills”	Robert
“I narrowed it down”	Matilda
“I checked them”	Jesus
“I just figured out the piece by looking”	Patrick

I spent a lot of time in the beginning of each lesson – front-loading or reinforcing the concrete, visual representations paired with a lot of auditory processing of mathematics terms and concepts to help participants make connections that they could tap into later in small groups or individual work. I purposely introduced ideas slowly to the group, sending the

ideas out like a line with a hook at the end, baiting the students to answer my questions in their own way. I purposely wrote in each lesson plan for me to ‘slow down to speed up’, which is a term I am borrowing from my time working on skilled manual labor – Tree pruning, construction, demolition, and remodeling jobs. It means to slowly get a clear understanding of the job at hand before picking up a tool. Mapping out exactly where electrical outlets are going to be placed and writing down exact placements of curves in a piece of conduit pipe, may take more time in the beginning, but once I was clear in the job at hand, the work flowed much more quickly and I would make fewer mistakes in the long run ending with a better product. Spending 20 -30 minutes driving a concept in a whole group may seem like a long time; however, it was mainly an open-ended classroom discussion/discovery learning session and did not resemble lecture. The students had to be participating, and when they did not many of their peers stepped in to encourage them. The front loading of the class is aligned strongly with the concept of “Slow Knowing” (Claxton, 1997) for deeper learning.

The supports that were the most effective were peer with a disability model/teacher and the slow driving of concepts prior to problem solving in groups. I saw the need to build in connections to these final supports, which include one to one direct instruction by teacher as well as concrete manipulatives and models to get the learner thinking about the concept. The supports should be used as one uses transit stops toward the final destination, which is a complete understanding of concepts as well as the procedural skills to solve all the problems. The continuum of supports, found in Figure 3, is a flow through model as needed, always looking to move the individual toward increased independence.

One example of an individual who worked through this continuum of successful whole group instruction, small group instruction, and an invented strategy came out of Class 7. Mindy, confident in her way of solving a problem for the 2 folds/1 cut argued with her group of three members completely confident that she was right. She proudly stated the answer was “5 pieces” and explained by showing each piece and how each fold created a different piece (1:44:53, Class 7).

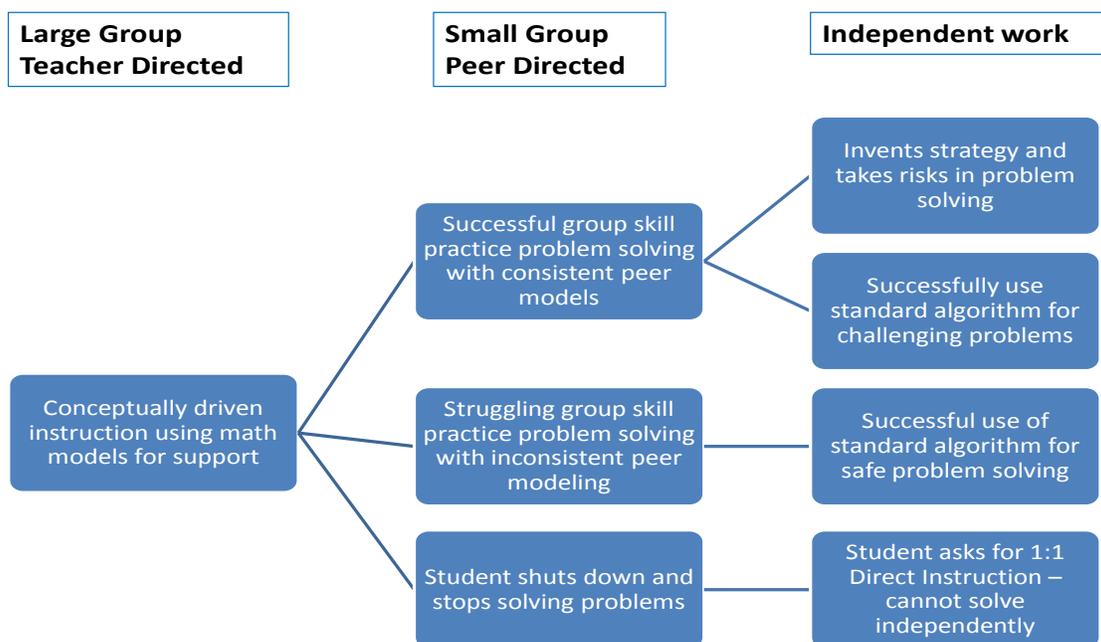


Figure 3. Paths toward invented strategies, solving independently, and one to one instruction

Theme Two: Money habits. Money habits of the participants were widely talked about among peers during unstructured time and within both large and small group instruction. Many times after class, during cleanup, while the tapes were still running, I heard parents and friends talking frankly about the money habits of the members of my group. I

ascertained from these conversations that the money habits of participants were deeply embedded and are barriers to financial freedom and control. I began to develop questions that I would ask at the beginning of class to uncover those habits, then later use a coding sheet to understand them. I thought, if they can change their habits, if only by degrees, they may worry less about money and live better.

I organized the responses in the coding sheets (Appendix E) within Money Club into three categories: The Impulse Buyer, the Gambler, and the Squirrel – I developed and chose the names of these categories. I developed the names specifically to evoke an emotional response when listening to the tapes, so I could more clearly code the data from the tapes. I wanted to understand the difference between a saver (Squirrel) and spender (Impulse Buyer). I also wanted to differentiate clearly between an Impulse Buyer who knows that they are getting something permanent (like a wallet) or short term (like a sandwich) and a Gambler who believes that they are going to spend to make money or spend with the hopes of making money only to lose all their money. It is clear from the data that members of the club are almost as likely to be a Squirrel (6 participants) as they are an Impulse Buyer (4 participants); however all Gamblers (2 participants) are also Impulse Buyers in this study.

The Impulse Buyer: Spend now and pay later. As defined in Appendix E, the Impulse Buyers enjoy the instant gratification of seeing what they like and obtaining it immediately. They buy on a whim, without thinking of long term consequences. Sometimes they have the money and sometimes they use credit, but what defines the people in this category is that they do not have the self control to walk out of a store once the impulse hits and must obtain the item they are seeking. I subdivided this group into two sectors: The

Collector who will buy things that are more permanent (TV's, CD's, non-perishable items) and The Spender who will blow through money on things that are perishable (food, drinks, and good times). Both of the above types also will rationalize their decisions as buying things out of immediate or future need. For example Spenders may stop off at the McDonald's to eat when they could have easily waited a few more minutes until they got home to make themselves a peanut butter and jelly sandwich. The Collectors will say that they bought a new TV because they needed it when the one at home still works.

Helen and Amy are Impulse Buyers: Collectors. They spend money on items that they can see and use into the future. Whether they are needed or bought frivolously is not known, all that is known is the manner of their purchases, which is on an impulse, so strong that they could not say no. Helen likes to spend on music, books, and magazines. Amy spends her money on the latest cell phone (on which she texts all day), tattoos, movies, and music. They both purchase things that they can enjoy or look at for years to come, spending in the name of need; but still in the throes of the latest urge to purchase.

Alejandro and Lynne are Impulse Buyers: Spenders. They primarily spend money on disposable items. They spend on a whim and have little to show for it after the experience. Alejandro spends his money on ice cream, Cokes, and Wendy's. Lynne will spend her money on food and good times. While Alejandro does not seem to mind his spending habits or their effects on his life, Lynne is bothered deeply by them. She will feel guilty and spend on things she needs to balance her impulse buying and so she can tell her stories and not feel too bad about it. Lynne genuinely feels terrible when she spends and goes through a 'buyer's

remorse' common to many Impulse Buyers. After listening to the tapes, I could only garner that Lynne is progressing and Alejandro is not attempting to change his ways at all.

The Gambler: I'll make it back later. As defined in Appendix E, the Gambler is a person who spends money to make money in high risk/high reward schemes that more often than not lose all of the money invested. These persons truly think that these 'one time opportunities' are golden and as long as they get in early they will make a large amount of money, often to make up for all the money they have lost in past schemes. Ponzi styled schemes on television, in magazines and over the internet took Lynne and Wes for a lot of money. They were both disappointed and hurt that seemingly great opportunities such as Publisher's Clearinghouse Sweepstakes left them with nothing. Lynne and Helen have also lost money in the local casinos on the outskirts of town and on the lottery. Both Lynne and Helen have sworn off gambling and Ponzi schemes; however, Lynne admitted to going to the casino recently.

Lynne claimed in Class 1 that she won money at the casino and bought a computer desk for her work at college (17:15, Class 1). A few minutes later, she expanded her original statement on how she made money in gambling by stating, "I went to the casino and won \$30 and put it back in my account." (25:27, Class 1). I asked her how much she took to the casino and she said she took \$60 out of her account and returned with \$30, losing \$30. She later talked about how bad she felt about taking out the money to begin with and that many people in her life do not trust her with money. She thought that returning with \$30 would build some trust with a guardian stating "I wish she (trusted me)" (26:30, Class 1). She has also been taken for a lot of money in magazine subscriptions from Publishers Clearinghouse.

Helen reluctantly admitted to gambling in her past and quickly changed the subject when asked, “I am not going to mention that” (18:20, Class 1). She brushed off her time at the casino as minimal and admitted to only doing ‘Casino Bingo’ (Class 1). In Class 3, she talked about how happy she felt when “I go to the casino to win money.” (4:01, Class 3). The excitement of bringing home money while having fun in a social environment was thrilling to her.

Like many gamblers, Lynne and Helen had great remorse when discussing their time in the casino. They focused on all the great times and especially those that left them with money in their pocket at the end of the night. Many people who gamble claim to have “broken even” just to hide the magnitude of their losses. Lynne truly believed that she had made money even though she lost half, which is why financial clubs and outreach programs are so important for people with DD.

The Squirrel: Wait and save. As defined in Appendix E, The Squirrels save their money and wait for the right time to spend it. They hide it away in a bank account not unlike a squirrel with their nuts. They hate debt, abhor credit cards and have generally been taught well by their parents about the evils of overspending. Saving is also a way of controlling their lives and gives them a sense of security. The person with a squirrel set of habits will always look to save first and dream of spending the money later, often times not spending it without others nudging them to do so.

Sometimes these individuals will save so much money that they will be in jeopardy of losing their SSI benefits. Wes saves money up until his maximum allowed limit, which is \$2,000, so as not to jeopardize his SSI benefits. He then struggles with how to spend it so

that he can focus on saving again. We brainstormed an idea of buying large purchase items that will improve his life and that he will need to ease the pain of spending all that hard-earned money. We came up with his buying a bed with a supportive mattress for his back after doing manual labor all day at Journeyman's Warehouse. He said that he is still using an old hospital bed and it is not very comfortable. Now he can spend the next few years saving for another large purchase that he may need.

Robert is also an example of a squirrel, he saves all his money in a savings account "In case I want something" and "One thing I learned is not to overspend money!" (16:24, Class 1). When pushed to talk about what he wanted to spend it on, he simply said, 'stuff'. During another class he beamed, "I just save all the time!" when asked what he spends money on. Mindy also eschews spending and says "I like to buy movies, but not all the time, I say no - you have to wait" (20:51, Class 1). She does have dreams of going to Hawaii and wants to save up money to go, but will not need to spend much because she will stay with friends. Gary wants to save his money for "A car, A car, buying a car!" (14:02, Class 2) and has a steady stream of income from his snack machines to slowly build up capital for a down payment.

The spending habits of the individuals of money club seemed to be consistent across classes and situations. The Squirrels looked for ways to deposit their money or pay off debt, the Gamblers looked to double down to make up for losses, and the Spenders looked to spend. A prime example of the buying characteristics of the Squirrel and the Impulse buyer happened when I asked how they would spend \$600 saved from brewing their own coffee for

a year: Amy (Impulse Buyer) would spend the entire amount on DVD movies while Mindy (Squirrel) would spend it on “Stuff that you need like a phone bill or food.” (50:08, Class 3).

There are dangers to each spending habit type, as displayed in Figure 4. Squirrels saved their money conservatively, did not go to places like pawnshops, payday loans, and were apprehensive of credit. They were not in as much danger of losing money to scams, yet were in danger of losing their SSI money, for they continued to save and lost track of the \$2,000 ceiling, which resulted in lost benefits. The Spender and the Gambler were in constant danger of running out of money, which made them vulnerable to scams, pawnshops, and payday loans to ‘float’ them to their next paychecks. They consequently were not in danger of hitting the \$2,000 saving ceiling, because money was spent quickly before it ever accrued interest.

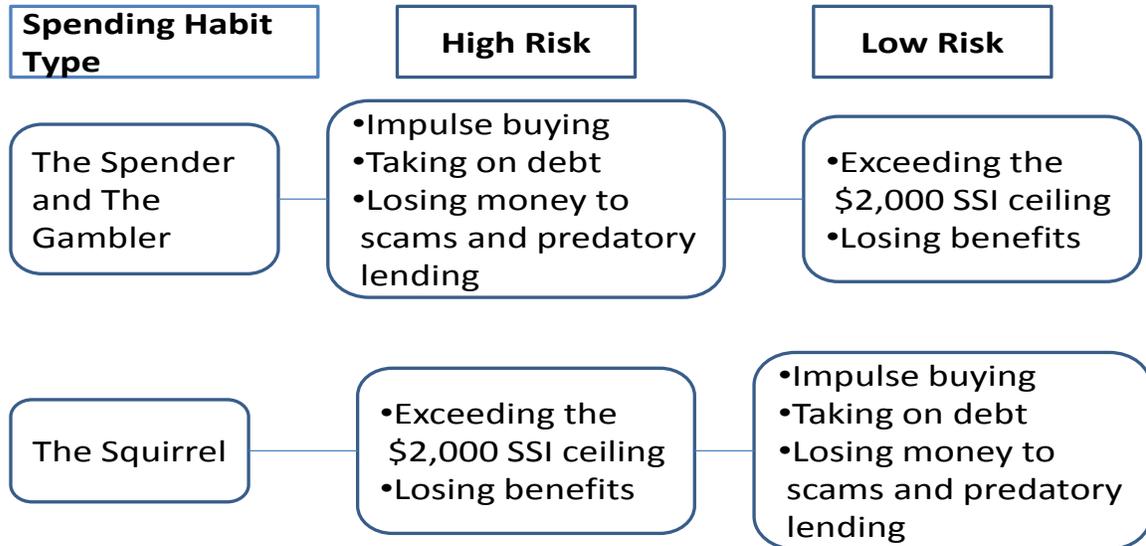


Figure 4. Money habits and risk levels for participants

In conclusion, the money habits of individuals in the Money Club are reminiscent of the study on *Deep Habits* (Ravn, Schmitt-Grohe, & Uribe, 2006). The individuals in this study were also very clear on the specific stores they frequent as in the study by Ravn et al., (2006). This may indicate that they were developing deeply embedded money habits, driving consumption. With limited incomes, these individuals are at risk for going into debt, which open them up to the predatory lenders and their scams. I found great value in mining the money habits of individuals with DD alone and as a precursor for vulnerability to the next theme: Scams.

Theme Three: Scams. When I was planning the curriculum for the Money Club, I geared it around the scams and pitfalls that could be troubling for persons with DD attempting to control their finances. I thought that many outsiders and strangers take advantage of these people and that I must warn them and demonstrate the many ways people can take their money. I did not expect that those who are in the business of helping others as well as our original protectors - our families, might be culprits behind the theft of many a member's personal items. In this section, I will detail the effects mail scams and pawnshops have had on the participants. I will also discuss a more surprising finding regarding how certain individuals who are the closest to some participants (family, friends and agencies) took advantage of them the most.

Mail scams. Lynne fell for the scam many Americans fall for every year when that large envelope arrives in our mailboxes from Publisher's Clearinghouse with the promise of Ed McMahon delivering the million-dollar check to our door after only a few magazine subscriptions. So like many of us, Lynne signed up for a subscription which placed her name

in the pool. She spent the next few weeks dreaming of what she would do with the money if she won. Meanwhile, she began to receive and read the magazine she ordered, unaware of what would follow.

She then received another letter in the mail asking her to buy another magazine subscription. The problem was that with each week that passed the number of magazines she needed to buy to stay in the sweepstakes increased, through the many rounds of whittling down the number of contestants. She needed to keep buying to stay in the contest. With an initial chance of winning of close to 1 in 500,000,000, spending any money on the contest is like making a basketball shot from the parking lot outside the gymnasium through an opening on the roof - an equivalent of flushing money down the drain and hoping plumbing does not run downhill. Lynne bought many magazines and she became very upset after being taken for her money by a national corporation.

Earlier in Class 6, I asked about any time they had been ripped off and Lynne did not respond, so the class went on to other things, one of which was how to help others focus in class and be supportive members. Then Lynne burst out with “I was ripped off and bought all these magazines and never won anything!” (41:20, Class 6). Wes was also taken by this magazine offer, and had to close his account from which the magazine was drawing money (42:17, Class 6). Almost an hour later Lynne responded out of the class context and seemed to continue her thought, “When I was young I used to respond to that stuff (junk mail), now I rip it up!” (1:50:00, Class 6).

Pawn shop. During Class 11, we worked on pawnshop mathematics, finding the different profits the pawnshop makes off of loans, pawns and sales of the people’s property.

We figured that when they brought in an item to pawn they would receive 10% of what they paid for it. If they are looking for a temporary loan and use their items as collateral, they may end up paying close to 20% per month on the loan. We applied the interest over a span of 12 months and figured out total interest payments for X amount of money borrowed. Then we solved how much we could expect to get for certain items given to the pawnshop. It was a high-energy lesson fueled by the personal experiences of two members of the class.

The pawnshop problem hit a few nerves in the class. Lynne immediately was upset and said in a loud voice “It was my boyfriend, he pawned my rings...I was mad!” (44:46, Class 11). Then Patrick, who is normally very quiet, called out “My dad pawned my \$900 bass guitar!” I asked him “How much did he get for it?” He responded “Not much” (47:01, Class 11). Later in the class conversation, he said, “They gave him \$80 for it.” (48:30, Class 11). We worked out the problem and found that he ended up getting 8.89% of original cost, close to the 10% average return on pawned items or an average loss of 90%.

I was stunned that so many of the members, who have not been taken by credit card companies, have had experiences with pawnshops. Credit card scams get to people in the mail and at college campuses, only three of the members went to college. The others would be excluded from the free T-shirt for signing up for credit booths on the main drags of many campuses. Possibly, many of the guardians or house managers of the group homes throw out the junk mail too. Therefore, if the people can avoid the credit card pitfalls, they can avoid getting suckered into high interest rates on credit cards.

They may not be taken to the cleaners in credit card fees; however, the participants are not so fortunate when it comes to the pawnshop. I suspect that since pawnshops only

operate in impoverished areas of town and that many people on SSI have limited incomes and rental stipends; they live in these same poor neighborhoods and walk by the stores on a daily basis. When they are in trouble with money and need a quick fix, the pawnshop is convenient and the fastest way of getting cash - the convenience principle related to 7-Eleven and Costco also applies to the pawn shop/money store and a traditional bank. No one will ask them questions about their job history, disability, or a paycheck stub, and for this convenience they will pay - losing nine dollars on every ten dollars they spent on the item originally.

Patrick and Lynne both were visibly shaken by this flashback experience. The mathematics problem hit very close to home and brought back very hurtful and emotionally damaging experiences. Losing the item and the money became a minor issue compared to the hope that was lost when they stated a family member or significant other took advantage of them. It was also a vivid memory, which the class tapped in to and learned from, so no one else had to go through that again.

I had to question myself on how far I was going to continue this particular conversation with the Money Club. I questioned whether the conversation was a therapeutic/cathartic one or becoming too upsetting to the members. I let the conversation continue, mainly due to my relationship with both members and I felt that each one was talking it out and feeling better. In addition, the other members were very supportive and gave them positive feedback. This brings up a cautionary point: When using real world mathematics problems that have the ability to unearth traumatic experiences, I would do so,

only with a group that supports each other unconditionally and I would monitor the conversation closely.

Family. The first protective layer is our families – those who are there to care for us. What surprised me the most was that the participants reported that family members took advantage of the participants in my study the most often and for the most amount of money. I originally geared the study to avoid ‘outsiders’ from taking people’s money, those found in pawn shops, money and check cashing stores, carnies at the state fair (workers in the games and rides section of the state fair), mail order and internet fraud as well as Ponzi investment schemes. Participants were involved to a small degree in the above-mentioned scams. Nonetheless, participants frequently reported that family members robbed them. The open-ended nature of questions to the group allowed me to capture data on a subject I had not expected: Those most in charge of protecting the participants take advantage of them the most.

Wes and Patrick both had their Supplemental Security Insurance (SSI) checks stolen from them. Patrick claimed he had his stolen from the mailbox by a family member. Wes was told that his parents would cash his check only to state later that it was cashed and taken from him. (26:00, Class 6). In both cases, the actual money was not the biggest issue. They were shocked and hurt that a family member would do such a thing to them. Both have endured challenges that come with their disability from peers and strangers, but coming from their family that broke their hearts. Hearing their stories broke mine.

Patrick was the subject of one of our most engaging mathematics problems when he told the story of believing his father pawned his bass guitar. We investigated and solved for

various other objects that we could pawn and get between 10 -20% of what we paid for each item. This math problem was a cold reminder of how this business works and how it takes advantage of people who are desperate for cash. Patrick expressed that he was especially hurt by his father, because he really wanted to have a relationship with him. During Money Club he would talk about an upcoming meeting with his dad, looking forward to it, then only to report later that his dad would pull a 'no show' leaving Patrick in the dumps for a few days (1:02:00, Class 10). Patrick always stated he forgave him and trusted that he would show.

There were times during these difficult and emotionally straining conversations when I had to catch myself from offering advice or alternative ideas for them to explore. I wanted to protect them from these pains, but I wanted to believe that the participants would learn to guard themselves. If I did it for them, they would never build capacity and armor to battle those who cheated them. One time I did tell Patrick "You are a great person Patrick, if your dad doesn't spend time with you he is missing out!" He smiled as he always did and went back to work.

Friends and significant others. The second layer out from family is friends and significant others. They are around us a lot and know our stories well. We look to them for support when things are going wrong in our lives and our family is not the best option to share with. I also found that in the cases of the individuals in this particular study, that their friends and significant others took advantage of them often.

Sometimes these friends and significant others had disabilities and often they did not. When they did not have a disability and had an appetite for crime, sometimes they saw openings to take advantage. They may on some level have cared for the individual, but after

so many years of bad habits, continued the cycle. They saw everyone as a mark and the person with a disability is a perfect target for them. I have witnessed in high schools, the person with the disability is often the one holding the drugs, stolen items, and paraphernalia for the group. In the adult arena, the person with the disability has the SSI check, a steady and set amount of money, if really small, that a small time street hustler or mid twenties couch surfer can latch on to and profit from.

Amy and Lynne were both very trusting individuals with hearts of gold, who were attracted to the street life: Amy to hip hop/gang culture and Lynne to abusive men. Both have had negative run-ins with ‘bad men’ who have fleeced them. They seem to leave these men after they have been taken advantage of, and within months, they find a clone with the same bad habits and abusive ways. Both Amy and Lynne have very restrictive guardians, who act as protectors who try to prevent the same events from happening again. Yet, this can only be monitored for so long, eventually people will do what they want to do, which for these two historically ends badly.

Amy’s boyfriends have not been kind to her. During Money Club, she claimed that one of her boyfriends who is in and out of jail had ‘borrowed’ her money to get out of jail only to disappear and never pay her back. He returned later and gets together with her without paying her back. I saw her a few months later at a League gathering and she told me that she finally met a ‘good guy’ who she is going to marry soon and gleefully showed me her ring. I was so happy for her and started thinking that bad habits can be changed and things can change for the good. Consequently, less than a month later I saw her again in the state capital at a Legislative Finance Committee meeting. I asked her how she was doing and she

sadly told me that, “He cheated on me, the wedding is off!” I told her she is better off and she replied, “I still talk to him and we might get back together.” How hard those habits are to break!

Lynne has had traumatic things happen to her from the men she dates: theft, physical and emotional abuse. Her boyfriends have stolen her jewelry, pawned it for cash, none of which they gave to her. She talked about it with clear anger and hurt that someone she trusted would do that to her. She often would ‘flashback’ to an incident and stew over it for hours at a time, sometimes erupting in class with a seemingly awkward statement about a prior abuse. After listening to tapes, I discovered her statements stemmed from a question I asked the class an hour prior. She vented for a few minutes and looked as if she felt better and could return to the class.

She is a few years older than I am and twenty years older than Amy is, but I see connections between the lives of both Amy and Lynne. She is older, hopefully wiser, and I am hoping the new man in her life is better for her. She sees a social worker with her boyfriend to see if they are a match for marriage. She feels restrained by the social worker, but at times she will understand why she cannot afford to have another bad relationship. She wants her guardian to allow her to marry her significantly younger man. Both have disabilities and he has seizures often and needs a seizure dog to help him.

Agencies. Agencies specializing in helping people with disabilities can often be as close as a friend or family member. They look out for people with disabilities, train them in their rights and organize services for them. They know all about their family, educational and personal histories, including all the streams of money coming to them, not unlike nursing

homes, which is also an opening for potential corruption. Only one member stated clearly that an agency took advantage of him and most of the members seemed to be satisfied with the agencies they were attached to.

Wes, during Class 6 was very vocal about RSAC, an employment assistance agency for people with disabilities. He claimed that they told him that they were going to take care of \$500 for him and ended up stealing it outright from him. He then continued with “They (also) took my stuff and sold it!” I asked “Who did?” He responded “RSAC took it!” (26:30, Class 6). He stated he has been taken by his family and now his agency. Wes has been molded by these events and now manages his bank account. We joked that when he hits his \$2,000 limit he could buy a big bed to stuff all his money in for the future to avoid losing his benefits.

Theme Four: Empowerment and Advocacy. *Perceptions.* The perceptions of those in Money Club were influenced heavily by their past experiences in mathematics classes. Many members of the club were afraid of mathematics and it took the first few classes to build up their confidence to perform mathematics at higher levels. Overcoming past perceptions, like habits, proved to be a great challenge. Many after weeks of positive experiences, would revert to their past perceptions after solving one mathematics problem incorrectly. More than six weeks would be needed to overcome this cycle of defeat and doubt.

The participants needed to have a brief, four-class review in the beginning, of basic math facts integrated into real life scenarios, to ground them in mathematics and build the foundation of confidence so we could move on. We also needed to move on quickly from the

‘remedial’ types of mathematics on to higher modes of learning, mainly because remedial programs are traps for those who do not excel in mathematics: Once they enter remediation, many never emerge from it. I have worked with many individuals with DD who have lost motivation doing the same routines they have done since entering these programs years before.

Many people, contrary to public opinion, do not hate mathematics; they are just afraid and unsure of themselves. “I like fractions, but I get messed up with borrowing and stuff,” Mindy (10:15, Class 5). It has been my experience that people will continue to work at subjects at which they feel they can be successful. Mathematics, like writing, is a difficult subject to master - once people understand the language and its multiple uses through application, they begin to enjoy the fruits of their labors. People sometimes give up on mathematics, when they are so close to proficiency, never to return. The perceptions of people regarding mathematics are powerful indicators of future engagement and success in mathematics.

Dispositions. Dispositions are habitual ways of looking at ourselves and the world around us; they are our basest tendencies and our default temperament and mood and are generally not malleable by the changing situations throughout life, a core component of Wehmeyer’s definition of self-determination (2005). Our dispositions can slowly change over time and like habits, need a lot of commitment from the individual to stick or reach a tipping point. Real change happens when our everyday dispositions are challenged over a long period of time, compelling us to perceive the world in a different way. Many of the members of the Money Club, as identified using coding sheets, came in with fixed

dispositions toward themselves and their ability to do everything, while others saw themselves as competent individuals who were just not cut out for mathematics but would try it. Having a risk taking or adventurous disposition helped participants learn mathematics, even if their initial skills were low. The codes, see Appendix E are an attempt to orient the dispositions of the participants with the mathematics related work in the Money Club.

Robert and Helen scored the highest in “advocate” coded statements in Money Club. They consistently looked for ways to help others. Robert was especially vocal as a cheerleader for others solving problems and clearly identified with being an advocate. In Class 5, while I was setting up for the lesson Robert explained why he came to the league “We are here to help the people,” (3:20, Class 5) a motto he lived by in class, always the first with a congratulations and a kind word for others. Helen similarly wanted to travel the world and present at conferences helping others become aware of their rights and train others to self-advocate. She was asked why she attended the League many times in class as well as twice in pre- and post-interviews and the answer always remained exactly the same as above, an example of the consistencies across environments of this disposition toward others.

Lynne has lived a rough and tumble life and has been taken advantage of often reinforcing the disposition of a victim, which was her tendency in the classroom whether in discussion or in outlook on various scams. To be fair, she had been victimized over a span of decades and a guardian was provided to keep her safe from repeating her past. She has truly seen the worst of street life and to her credit, with the help of local advocacy groups; she is getting her life back together. While others learned about scams and talked about their own experiences as victim at one time, Lynne viewed all these happenings as an expected part of

her life, something that will continue to happen. There were times when she spoke proudly of attending Central Community College and meekly smiled when she solved problems correctly, but she always looked at those things as ‘luck’, never seeing that she is capable of skilled work.

Robert, Helen, and Gary scored highest in the self-determined area of the study. They all viewed themselves as capable, smart and able to make changes in their life. They also had the highest rate of parent visibility in the class, meaning that their parents were always talking to the members of the League in the office, watching class, and organizing events. Often I spent time after class, when their parents came to pick them up, talking about current events. Behind these Self-determined individuals were empowering and passionate parents who saw that their children should get the most out of life. Gary’s mom was on the board for the league, Robert’s mother was an active advocate in the league and Helen’s mother had been slowly transitioning her daughter to an apartment and was involved in everything she did.

Antonio, Patrick, and Amy scored highest in the Passive category. They were able to answer mathematics problems and in small groups participated well; however, they did so in a quiet way as if they were taking in the scenery and not completely confident in their answers. They solicited the group for hints at whether they were doing things the right way. It took a lot of work to get them to talk about their mathematics thinking. Antonio may have been quiet due to second language issues. Patrick and Amy really wanted to do the right things in class and this led to a passive nature in class.

Alejandro was the only member who consistently came to class who was aggressive towards himself or others. He suffered from mental health issues. He would lash out at

himself or others in a quiet way. Only after listening to the tapes did I realize how angry and apprehensive of others he is. The two individuals who disrupted the class also rated extremely high on the aggressive scale, with over 20 aggressive acts in the single classes they attended (taped class sessions). Both individuals did not make it through an entire class, Tracy leaving after 45 minutes of class 10 and Eddie leaving $\frac{3}{4}$ of the way through class 8. Alejandro especially acted aggressive to get people to leave him alone. He avoided group interactions and sat at a table all by himself, saying hurtful things to others in the group from afar, and then later saying that everyone hated him.

There were not clear patterns in negative and positive dispositions. The confidence of the individuals usually dictated whether they were saying positive or negative things. Our daily snack impacted their opinions as well. Right before snack, things trended negative, during snack always positive. Successful problem solving brought on very positive self-talk and incorrect answers brought out their doubts. Positive and negative statements were less reliable and fixed within individuals after review of the tapes and coding of each statement.

I expected advocates and those self-determined to be consistently positive in class and victims negative, with those passive to be somewhere in between. I was wrong. The advocates and self-determined individuals were that way during tough times and great times, mood and positive and negative feelings did not change the type of person they identified themselves as. Lynne was 'in transition' or recovery from being a victim to living a more self-determined life. She needed a great deal of support to realize this life and she kept those supports in place grudgingly because she knew how easy it would be for her to go back to the

life she used to live. Dispositions can be changed, and it may take the energy of stopping a bullet and redirecting its course to do so.

Engagement. Student engagement was most consistent in whole group instruction. Small group instruction had the highest engagement in spurts, which would be dependent on the peer model that was running it. The peer model would need to be both prepared well by the large group instruction and work consistently with their group to achieve success. One to one direct instruction would have an initial small burst of engagement with deteriorating returns the longer I spent with the individual. Overall, as the Money Club progressed, especially after Class 7, engagement increased as noted in both design notes form (p.50) and in coding sequences. I noted that the reason for this was that the groups were used to working with each other, knew the flow of the class and could anticipate how each lesson was going to run and act accordingly.

Whole group instruction was more consistently engaging due to two factors: students became the show and could demonstrate their skills to a large audience and the teacher had a great deal of control over how the group worked and attended to engagement levels quickly as they arose (8:10, Class 10). Participants were excited to show their skills or just be the actor on stage participating like an audience volunteer at a show. The participants vied for center stage, each wanting to engage the group with their answer or a tangential story that sometimes led to good questions and answers.

One vivid instance of the whole group working at a high level was when we were working the concept of breaking and joining in algebra using paint stirrers (Class 10). Robert wanted to demonstrate how to break up the paint stirrers using his Karate skills. Everyone

was glued on him, which added to the drama of the lesson in ways I could not have imagined. After screaming “Hi –Yah!” (5:34, Class 10) he snapped his paint stirrer in two. The others joined in the excitement and broke theirs. He responded with a triumphant comic book superhero reply, “I do not like to show off, but in this case I had to!”(6:19, Class 10) After they pieced the paint stirrer back together I asked them “What does algebra mean” Mindy said “fractions”, while Robert stated “You split them up and then you put them back together” (6:54, Class 10) which is an exact definition of rejoining in algebra.

Supportive nature of the Metropolitan League of Self-Determined Individuals. In addition, the group was supportive of each other as evidenced by this interaction between Helen and Robert in front of the whole group. I asked in Class 5 how much $\frac{1}{4}$ of 64 is. Robert spoke up and said “18”, Helen, sitting next to him, gently so as to not to bring attention to herself said quietly “16” (1:01:00, Class 5). Robert blowing the cover Helen laid for him earlier, blurted out in a very loud voice, “Wow! Helen you are a real whiz at mathematics!” She replied gracefully “Thanks Robert.” (1:01:20, Class 5) These types of interactions were very common in the Money Club.

The league is a supportive place and the culture of the league emanates to all that enter the place. For example, in Class 5, I commented in the design notes form (p.39) how supportive the members of the League are with each other, even in potentially embarrassing situations. We were finding out the percentage of free throw attempts with all the participants, using buckets as baskets and crumpled up paper as our basketballs. Many people in this situation really wanted to sink the most free throws and it got contentious, causing many of the ones who are not skilled in this area not to participate. Nevertheless,

everyone participated in two smaller groups. People still joked and kidded each other but it never got aggressive or insulting – when people missed and it was obvious that it bothered them, the other members encouraged them.

Another example of how supportive the League is was when Lynne was having a tough time with fractions. She could figure out any percent with $X/10$ tries, but with $X/5$, she froze. She made 2 out of 5 attempts, and I asked her what percentage it was? She replied “10%” I said “You are thinking that if you make the same amount with less attempts the percentage goes down?” (48:11, Class 5). She said “yes” I replied “It doubles” I quickly came back with “What is $3/5$ as a percentage” and she nailed it “60%”. Many people in front of the group would have a hard time sticking with my line of questioning, but she kept at it. The group cheered her on, which from her expression, she knew would happen. We created a bar graph on the board, to display shooting percentage and based on the graph we decide that in order Gary, Wes, and Mindy would be our three best shooters in clutch situations (51:05, Class 5).

Direct instruction. Direct instruction and its usefulness, as I have stated before, is like the Law of Diminishing Returns in economics – the longer and more often in a class that you engage a student in it, the less effective it becomes, as we learned in Class 5 (1:39:00). Almost in a steep linear or narrow semi-parabolic line effectiveness decreases so rapidly that as a teacher I must try to get in and out fast enough so that I do not make the student dependent on me. I would move from student to student as fast as I could to avoid getting stuck in a one to one tutoring or paraprofessional mode, where I locked in on one individual and attended to their every need. This became a big problem in Class 2 (p.12, design notes

form). This relationship often becomes suffocating like a straightjacket, eventually trapping the student and teacher and weakening our collective skills by becoming codependent.

Post Interviews

During the last week of Money Club, I conducted a second round of interviews with the same individuals who agreed to an interview before the class started. I wanted to explore the nuances between the participants' answers before and after their time in the Money Club. I asked the same questions as before and allowed the interview to move in the direction that the individual felt was important. In some cases, as with Helen and Mindy, they began to run the interview and I felt as if I were on the spot answering their questions about the Money Club. Other times, as with Wes and Robert, the interview went like two co-workers talking about a completed job or teammates recapping a season. Amy and Lynne had many similar responses to mathematics specific questions; however, when it came to learning and empowerment their answers changed markedly. Three individuals declined to take a second interview. They said they were tired as we all were after a grueling 6 weeks.

Hypothesized themes that held between pre and post interviews. A few of the hypothesized themes explored in pre-interviews held out to be fixed constructs during the post interviews: Components of nature of mathematics as well as teaching and learning. Questions that explored the nature of credit and school experiences were answered in such a way that they could not be found to be similar to pre-interviews and will not be documented in this section.

When the participants were asked questions about the nature of mathematics, many answered exactly the same as they did in pre-interviews. Lynne, for example, answered that

mathematics was for “everyday living” and when she heard the word algebra, she stated “numbers.” (p. 39, interviews) Amy, when asked the same question said ‘mathematics’ then clarified with “use your fingers” (p. 51, interviews) to solve mathematics problems, which was a similar response to pre-interviews.

Mindy did not admit that she could answer mathematics problems correctly. The nature of mathematics for her was to use a calculator to solve problems and get correct answers. Getting the right answer with that specific tool was the nature of mathematics and part of the process for her since she could not do them herself, an opinion that I would contend with after watching she solved many problems without the calculator in class. She stated she needed to use the calculator in a way that caused me to think that she was on the cusp of admitting to being able to solve her own problems. Here is an example of the interview.

A: OK. Now, that you've done algebra, when I say the word algebra, what do you think of?

L: Going ahead on your calculator.

A: Going on you calculator? Is that how you got some of the answers?

L: (chuckles)

A: (chuckles) You're honest, that's good.

L: (chuckles) Yeah. Well, I brought my calculator.

A: You brought it today?

L: Uh-hm.

A: So the calculator helped you solve some problems?

L: Yeah.

(p. 48, interviews)

The conversation continued in this fashion, so I abandoned the line of questioning and found a new question to ask. When she was laughing, I did not want to contradict her, to respect her answers and go back to her later and get a better answer.

Many of the questions I asked in the first set of interviews I did not ask the second time, such as those involving their past school experiences which would not be any different from before. This included questions about their favorite subjects, their mathematics teachers in school, and what they thought of when they signed up for the Money Club. I also did not want to ask questions that would get me answers that could be seen as disingenuous or self-serving like: “Who is your favorite or worst teacher” after I just taught them.

Differences and changes between pre and post interviews. There were significant changes in the responses during the post interview process. The areas that were impacted most concerned the nature of credit, school experiences, and problem solving.

Empowerment was coded as a dominant theme in the post interviews. The individuals commented widely about how proud they were of themselves after the successful completion of the course and was noted in the coding sheets. Many participants could talk specifically about how they learned best, what they learned and how they were proud of themselves. Scam understanding and avoidance were also talked about in the post interviews. Many individuals spoke about how the club was a worthwhile endeavor, and they were satisfied after taking the class. A few talked openly about their initial reservations.

The nature of credit. Initial interviews yielded little information in this area, post interviews proved more fruitful. Lynne talked at length about different loans,

A: What do you know about, uhm, loans?

C: That, some loans you have to pay back and some you don't.

A: OK, can you give me an example of a loan you don't have to pay back?

C: Like a Pell Grant

A: OK.

C: For school, like a scholarship.

(p. 40, interviews)

Lynne probably knew about these things prior to Money Club, but felt comfortable answering it this time around. Many of the members opened up much more on the subject of credit, not afraid of being wrong.

I spent a great deal of time researching credit cards, watchdog agencies, and the mathematics algorithms of the credit card industry. I asked Mindy a few questions about the nature of credit cards and she responded.

A: What do you know about credit cards?

L: I don't want one.

A: You don't want one?

L: Well, if I get one (screaming) I wanna buy that!

A: Yup.

L: (chuckles) So, I don't want one.

(p.49, interviews)

Mindy, during Money Club, always thought before she spoke and would often take in the surroundings before participating. When she did speak, she was certain that she believed what she said. Her curt reply of “I don’t want one” resounded with me in the post – interview. She was speaking from her gut, as if repulsed by credit cards. Her second response about going out and buying everything may have been an exaggeration and she might have been talking about someone else in the club without her sense of restraint. It would be outside of her personality to buy impulsively. She was coded as a squirrel.

Wes stated how much he had come around since joining the League, from bankrupt to having \$2,000 in the bank. The Money Club did not improve his financial situation in any way. He just felt like talking about this issue, which he spoke of often during money club.

W: The matter of fact, I've, uhm, I've, things have changed a lot for me, uhm, and uh, even before I even started here, if you don't mind me mentioning the league here too?

A: Oh, no, absolutely.

W: Uhm, because, uhm, in fact my accounts are a lot better than they've ever been

A: Really?

W: And I've never, you know, I've got so much money right now, I'm having to spend it actually, yeah, so it makes me, uh, makes me feel good, you know, that I went from being bankrupt

A: Yup.

W: 'Cause I had been there, to uh, you know

A: Instead of having... you still have \$2000 in the bank.

W: Yup. To have this much money.

A: And that being a problem, like you can't have more than \$2000

W: Yeah.

A: And you actually have to spend it now, so you cannot lose all your benefit.

W: Yeah.

A: Wow. That's a great problem to have actually.

(p. 36, interviews)

Many of the members after the conclusion of the Money Club did not specifically state their understanding of credit during the interview process, although during class they talked about credit and its influences on life.

School experiences. When I asked questions about school experiences this time around, all the answers either tied the past into the present, or focused squarely on present school related issues. It may have had to do with the participants' knowing that they already answered the question earlier and wanted to talk about something new or possibly that they were still focused on the learning in the Money Club or they all were looking ahead to the future.

Lynne concentrated her answers on the past day at Central Community College signing up for financial aid for the upcoming fall semester, "At Central Community College, today, I had the run-arounds trying to get my financial aid." (p. 39, interviews) She took my questions about school experiences very literally and went into great detail about the system and how frustrating it is working with the bursars, registrars, and other entities at all colleges.

C: There's so much red tape that you have to go through.

A: At the university, yeah.

C: Just to get stuff, and then they get you in the wrong classes and, a big ol' mess.

Every time I go there, I have to run, have to do a lot of running around.

A: Yup, and it takes a long time.

C: It took me two and a half hours.

(p.39, interviews)

She was able to bring the interview back to the importance of mathematics in doing the job at the bursar's office, "Cause they had this, one little area threw it off, and that's why mathematics is so important. They, they put that I already had a Bachelor's degree, but I don't." (p. 39, interviews) I told her that was a great problem to have – too many credits. She said it was "an honor" for them to think that she already graduated with a bachelor's degree.

Later in the interview, I asked her about her work as a peer mentor to Amy. She replied with, "I was really surprised to see Amy participate. She really opened up. She blossomed in that class, and that was amazing!" (p. 41, interviews) She has known Amy for a while in other League activities and the club gave her a chance to work with and see the potential of a peer whom she viewed as 'shy and quiet' prior to the Money Club. She was impressed also with Helen, "I also thought Helen was smart." (p.41, interviews)

Mindy and Amy, two of the younger members of the club, responded to what they remembered about the experience of the Money Club. Their responses were clear and brief, but spoke of a deep truth about what a teacher must understand in running a voluntary, non paid, no credit, Money Club. Mindy responded with, "snacks" (p.50, interviews) and Amy responded with, "friends." (p. 51, interviews) I thought both of these answers were keys to

the success of the club. They may have shown up for the snacks at first, but they regularly attended for the friends and the people in the groups. Wise teachers know how to get the best out of their students, how to motivate them with primary motivators like caring and good food to stick around until secondary motivators kick in like pride, curiosity, and a need to learn.

Problem solving. Many of the participants responded more robustly about their problem solving and cited examples from the Money Club to back up their statements. Confidence in problem solving seemed to improve as the class went on with more problems solved and this was validated in the interviews. Two individuals claimed to be able to solve problems and see answers “in their heads.” (p.43, interviews) One individual gave a great example of variable values.

Lynne, as stated earlier, doubted herself when solving problems. She double checked her work and showed all the steps necessary to solving problems but only answered my questions and participated after disclosing that she had the wrong answer. I confronted her on this during the last interview.

A: One thing I noticed is that you're really smart at mathematics

C: Yeah

A: But sometimes you don't think your answer is right.

C: Yeah.

A: But it's right. So can you tell me a little bit about confidence in mathematics?

C: I just have to have more confidence in mathematics, and believe more in myself, which I didn't believe in myself, but through this class I did do believe in myself.

A: You're good at mathematics, and that's one thing I want you to know. All your answers, when you worked them all out, when you showed all your work, they were beautiful. So, thank you.

C: You are welcome.

(p. 42, interviews)

The more she solved problems the more confidence she got, but she only participated at first if it was acceptable to have the wrong answer. A culture of taking risks and encouraging mistakes primes a class to open up and get over their anxiety, knowing that all attempts at the right answers will be encouraged and supported even if they are adjusted to proper thinking and procedure. Fear of the embarrassment students remember from past mathematics classes must be addressed if risk taking is valued in class.

Robert's disposition toward problem solving changed markedly. During his initial interview he claimed to be a "mathematics wizard"; however, this turned out to be true only when he was taking on problems he knew the answer to. In the beginning, when challenged he would give up and begin a sequence of negative self-talk until I came over and told him he was better than that, set him up with another problem and stayed until he succeeded. He would then bounce back and become the "wizard" again. At the time of the interviews he was very excited to answer questions especially one on problem solving.

A: Great. What did you like about doing algebra? Did you like the one-step problems or the two-step problems the best?

R: (inaudible) I liked the two, two-step problems, the one-step is easy (claps) like that. The two-step gave me more (inaudible) intuition in mathematics.

A: So, you like the challenge?

R: Of course.

A: Well, after knowing you, of course, yeah.

R: (laughs)

A: What would you tell someone who may say “I don't like to be challenged in mathematics.”; What would you tell them?

R: Well, that's an easy question. I would tell them: “Look, you've gotta know you're mathematics, if not, you're gonna end up with a problem.” Let's say, hang on, let me say this, let's say we have 4 or 5 cheeseburgers and I have, eh, you have one and I have one, and the rest would be like, for Mindy, for Matilda, for Gary, for the rest of the guys. One thing is for sure, is that, all of us have to divide how many cheeseburgers we're gonna eat.

(p. 46, interviews)

I appreciated the fact that both Robert and I would have a whole cheeseburger and the other 2-3 leftover, would then be divided amongst the rest of the group leaving them with possibly less than a full burger. This is actually a good word problem that he thought of on the fly.

Helen and Wes, when solving algebra problems would leave out key steps and just write down numbers as markers after they solved a step in their heads. They both claimed to do the mathematics in their heads. I think the writing down of the number that they got in one-step of the problem gave them enough support to finish the problem. It also reduced the cognitive demand of the problem, not having to hold the one number in their heads while

combining it with the next variable. Helen talked about her process for solving the mathematics problems in her head in this way.

A: What did you, how did you solve problems in algebra? Do you remember?

C: Uhm, in my head.

A: In your head. So, you just got answers in your head?

C: Yes.

A: Wow, wow, were there any specific ways you did it, or you just came to your head?

C: Uhm, kinda hard to explain. We had to figure out where to put the x and the $-$ and all that.

A: OK

C: and, uhm, kinda hard to explain.

A: OK, 'cause I noticed when you were solving problems, like, you didn't show a lot of the steps but you had the answer in your head.

C: Yeah.

A: So, instead of saying, like you know, the opposite of -5 is $+5$ and all that type of stuff, you would just say, like $20 + 5$. And you would get 25 and you would write a 25 down?

C: Yes.

A: And instead of $5x$, you would just divide by 5 , not show your work and write the answer is 5 , $x = 5$.

C: Yes.

(p. 43-44, post interviews)

The problem she was solving for is $5x-5=20$. Normally the person shows how they increase by 5 on both sides to get a 20 on one side of the equal sign and a $5x$ on the other then divides by 5 on both sides to get $x=5$. She just ‘unties the knot’ in her head, leaves a markers, the answer for each particular step, of 25 for one step and 5 for the second one. Figure 5 shows Helen’s way of solving the problem, which takes fewer steps, leaving markers and also requires less cognitive demand (recalling 2 distinct steps instead of the multiple number placements and steps in standard algorithm).

Standard process for solving 2-step algebra problem	Helen’s way of solving 2 –step algebra problem
$\begin{array}{r} 5x - 5 = 20 \\ \quad +5 \quad +5 \\ \hline \underline{5x} = \underline{25} \\ \quad 5 \quad 5 \\ \hline x = 5 \end{array}$	$\begin{array}{r} 5x - 5 = 20 \\ \qquad \qquad 25 \\ \qquad \qquad \underline{x = 5} \end{array}$

Figure 5. Standard algorithm vs. Helen’s way

We talked about pre-algebra concepts of a variable standing for any number when we were counting cards. We placed value of 11 for ace, 10 for King, Queen, Jack, and used them to add. He discussed the different values for each card,

...you know, like the king and the queen, and then the ace diamonds, and, you know, it kind of, uh, surprised them, that you know, the king is worth so much and, you know, the queen is worth so much. (p. 37, interviews)

He ran his group during card counting and found that using a game that everyone is used to playing got the basic concepts across. He talked about how he taught skills using poker and giving them combinations of cards to play in Blackjack or 21, to “not bust.”

Mindy talked about her time solving problems in the club. She saw value in the following areas, “It's a good club, money club, you know, learn how to do mathematics stuff and get good to go, I guess, if you wanna go to college or if you are buying something, or saving up” (p. 48, interviews). The class worked out how she could realize her dream of going to Hawaii, with different amounts saved over a few months. We graphed the varying amounts and saw how many weeks it would take at savings rates of: 100, 75, 50, 25, 10, and 5. At \$100 it would take her a little over 8 weeks, and at \$5, a little over 3 years (p.62-63, design notes form).

Empowerment. Through the cycle of personal empowerment (Luckasson, 2006), the individual makes choices, takes risks, and learns from them. Empowerment is an internal feeling of confidence in oneself and one's capability to do things, which is strengthened with each cycle of personal empowerment as seen in Luckasson (2006). It may or may not involve an increase in complete sets of skills, but rather a feeling that a person can reach his goals and is on the road to developing a complete set of skills in an area of his life. I noticed that after interviewing the group, the statements that I could categorize as empowerment after teaching the Money Club were happening too often to ignore. In this final section, I will report on the

statements that came out of interviews that I was not expecting at all. The empowering statements can be broadly organized under the following categories: rising to challenges; protecting yourself with financial literacy; overcoming mental roadblocks; and having fun learning. All of these categories are empowering feelings where nothing is impossible and that learning can protect you from future scams.

During the Money Club, we worked out mathematics problems applied to the many scams that can debilitate a person's life. Individuals lose money which in and of itself is painful and harms their financial outlook. Still, if one looks at all that money lost and thinks how saving or investing that money in legitimate avenues, one can see how compounding a few hundred lost here and there can ruin a person's long term financial plans. Many individuals who were past customers mentioned how shocking the pawnshop algorithm was. Helen was adamant about not getting a credit card after learning all the escalators in a person's monthly bill – for example, overdraft and late fees as well as rate increases for lateness. She was pleased that the Money Club addressed this issue, “That you don't have to prevent being a victim of scam, and what's the difference between credit and debit card and all that.” (p.45, interviews) She felt empowered that after the club she did not have to be a victim and could avoid these scams.

Lynne was still going through a battle with her home health care provider over control in her finances, so anything that she learned in the Money Club, paved a path toward financial freedom. She talked specifically about one lesson where we did internet searches on organizations, banks, investments, and credit card companies. We then searched through

financial advocacy groups and did checks on the best ways of getting credit, loans, and investments. This is an excerpt from the interview.

A: Uh-hm. Yup. Good job. Uhm, what was the Money Club like for you and mathematics?

C: It was fun. It makes you do a check on them, when you're doing your own checks, and helping people to know how to speak up for themselves, instead of all the home-based (?) talking when you go to the bank. It's your responsibility, not theirs, to talk for you, and I just really hate that.

A: So, you would like a class that combined the advocacy of student (?) helpers resolve (?) with the money?

C: Yeah. Uh-hu.

A: Good idea actually.

C: Because, there is probably a lot more people who are home-based, that their home-based provider does all the talking and I'm having a meeting about it Wednesday. She doesn't know that the meeting contains mean stuff a lot about her.

A: Oh. So, you're gonna spring that on her and tell her about some of the things you are a little bit upset about?

C: Yeah.

(pp.39 – 40, interviews)

Lynne saw these lessons as not only great for her, but saw that many people are in her situation - receiving SSI benefits, income restrictions, and bad spending habits. To be fair, she has admitted that the reason she lost control over her finances was due to her falling

victim to scams and her love of gambling and impulse buying. Now that she has stabilized, she wants to get off this 'probation type' living situation. She wants a chance to prove herself, as we all do. This is an empowered individual who wants a chance to demonstrate to her guardian and social workers she is responsible and can run her own life.

Rising to meet the challenges of everyday life requires a confidence, not that a person knows all the answers or will be successful all the time, but that in time, after many possible failures he will come out on top and do what he wants to do. Robert, who could easily make a living as a life coach, exhibited an empowering mentality in many of the things he did. Learning mathematics challenged him on more than one occasion, but in the end, he continued with his belief that he can do anything, including algebra.

Helen, who from the start was a quiet and caring yet dominant personality within the Money club was a great peer tutor to the other participants. She would patiently work side-by-side with them offering moral and cognitive support, and never ever making the problem any easier for the person. She was unwavering in her approach that no one learns anything from giving answers. She felt both empowered in teaching this way and also empowered everyone in her group that they are just as capable as she is and can do the work,

'Yes, it's OK to help people, but sometimes, if you overdo it they are not gonna learn. They not gonna be doing it themselves... Yeah, sometimes it is hard, to really keep my mouth shut and be quiet, and that (inaudible) you know.' (p. 45, interviews)

She has encapsulated in this statement how teachers can teach too much, talk too much, and help too much, where we end up weakening the individual's sense of capacity and capability. Teachers mean well, but once the individuals leave our class they have learned

that if they cannot do something, someone else will do it for them and they will still get credit for doing it. People with DD need to have the true feeling of accomplishment after struggling, failing and getting back up again. Helen's belief that one needs to take the hard road and do things themselves helped everyone in the Money Club and reinforced my own ideas about learning for people with DD.

In my first interview with Wes, he talked about the frustration of his side-by-side program and how it was not helping him at all. His mother had him graduate before his 22nd birthday, because she saw that the programs were not working for him. He was visibly upset about his lack of access to real learning, both in high school and at the community college. His final interview was quite possibly the interview with the most empowering statements in Money Club. He sounded like a person who had realized his potential and abilities, sometimes it can be shocking, something you never thought was within your capacity. The extended excerpt from the post-interview I think is worth the space due to his response.

A: When I say the word algebra, what do you think off?

W: Uhm, it's very helpful, uhm, from what I've learned from this class, uhm, I'm amazed, uhm, because, now I can do things, that I never thought I could.

A: You are very good at it by the way.

W: You know, I never thought I could do. It's a neat thing to have.

A: Yeah.

W: And I, I, myself I never thought, I would get it.

A: Uh-hm.

W: You know, you know. Since I was in special ed and stuff, they never taught anything like that. You know, it's just like... Now

A: And you could see it in your head.

W: Yeah

A: You see it in your head, without even writing it down. That is the part that amazes me, you just see the answer, and it just kinda comes to you and then you throw it out there and it's like, yup, that's right.

W: Yeah.

A: Yeah, so that's excellent. Uhm, let's see. How do you think, you learn the best, uhm, just in general?

W: Uhm, by doing. Uhm, because I figure, if you don't know something, it's always the best thing to do is try.

A: Yup.

W: (inaudible) try what you're doing, and, or what needs to be done or whatever, and if it's something that you don't think you can do, I think, it's, you would have, uh, a better life, if you'd at least give that a chance, you know.

A: Absolutely, take that risk.

(p. 35, interviews)

Wes' insistence that he needs to just try things out and give it a chance is why he can solve mathematics problems. The best mathematicians have risk taking behaviors and a capacity for failure that give them a chance at great things. Wes' empowering story can motivate others and that is the real force behind the Money Club. For anyone, with any

disability, to take a risk and get just a little better at mathematics and finance – as we say, come for the snacks and stay for the mathematics.

Ideas regarding interviewing people with DD. After interviewing the adults in the Money Club, I concur that there are a few barriers that can get in the way of the interview: (1) Many members of the Money Club would answer in brief statements if I let them. (2) Many members of Money Club would tell me what they thought I wanted to hear (3) It is easy to think that persons with DD are done talking when they pause for a long period of time, but I needed to wait, and possibly after a while, ask follow up questions in a way similar to what I had asked before, so as not to confuse them (they may think I was asking a different question).

I also found that many adults with DD have a clearer idea of their schooling and past experiences the older they are. I noticed crystal clear explanations of past injustices at school from those older than 30, while those younger would give me simple, non caustic and people pleasing answers about subject matters and experiences with teachers. I could have taken this as a sign that teaching has improved markedly in the past ten years; of this, I am not convinced. I do believe that our memories become stronger and more nuanced as we grow older due to our minds re-remembering and restructuring the memory each time we go through that past issue, deepening our understanding of the problems. As stated in chapter 2, our memory is constantly being constructed (Hiebert & Carpenter, 2005; Jensen, 2000; Leamnson, 2000; Taub, 2004). Those above age 30 have more cycles or experiences and recreations of this memory, which has opportunities for more explanations of why this or that happened. I think if I interviewed those under 30 in ten years I would get a completely

different interview with more detailed examples of their schooling, and subject matter experiences.

The research questions. When I began the study, I wanted to understand what specific experiences affected the beliefs, perceptions, and classroom actions that emerged for participants and their teacher during the Money Club.

The first sub section to this question specifically focused on the themes, which emerged within the people with DD as participants. The four themes that emerged came directly out of the taped conversations both in class and during interviews of the participants. I used extensive coding to answer the questions and the final matrix cut was: (1) Problem Solving, (2) Money Habits, (3) Scams, and (4) Empowerment.

The second section to the main question, how did the experiences – the beliefs, perceptions, and classroom actions impact instruction and planning from the teacher/researcher? My prior experience as teacher, those beliefs and perceptions of teaching and learning influenced the class curriculum and my own actions. I adjusted those habits to the daily interactions of the individuals; however, the most significant impact of the class was a renewal of spirit and recommitment to the profession of teaching. A profession that I never saw myself in at any time prior to college.

The second section to the main question was how are spending habits and financial abuse by others addressed by higher-level mathematics for people with DD? Throughout the Money Club, I discovered that the learning of algebra became a support for learning about spending habits and financial abuse. When the participants saw in a mathematical, model how a specific spending habit compounds your losses over time it signaled a need for change.

People in theory know that over spending and being taken by scams has negative effects on your finances; mathematics demonstrates to what extent these negative effects impact your life. The algebra, the gatekeeper to higher mathematics became a tool for understanding spending habits and financial abuse.

The final component of the research question was what specific supports within mathematics instruction were used to deliver the information? Peer models with similar disability supported small group instruction by knowing when to push the participant to achieve and when to step back and let the individual work independently. Mathematics models increased understanding of the mathematics problems. Front loading with conceptual understanding gave the individual the support to solve problems independently and in small groups.

Summary

The participants who completed the 6-week class on money and mathematics performed mathematics at a higher level than they did in the first week. They were capable of inventing strategies for solving mathematics problems. Peer tutors with similar disabilities were experts at continuing to readjust the weight of learning on the struggling peer while motivating them to do their best. Conceptual understanding is a cognitive support and must precede skill-based instruction. Applied mathematics instruction-especially with the use of mathematics models, and changes in groupings provided supports for solving mathematics problems involved in financial matters and scam avoidance. Many individuals in post interviews exhibited empowerment, self-determination, and advocacy behaviors after taking the Money Club. The design experiment expedited teacher learning and improved instruction

within the classroom. Engagement in mathematics activities led to improved participation in Money Club. Most importantly the use of mathematics as a foundation for learning about finance, scams, purchasing, and saving was seen as essential and provided the support necessary in understanding these challenging concepts. Understanding these concepts led individuals in the Money Club toward empowerment (see Figure 6). The Money Club also improved this teacher's understanding of the perceptions of individuals with DD in the areas of problem solving, money habits, scams, and empowerment.

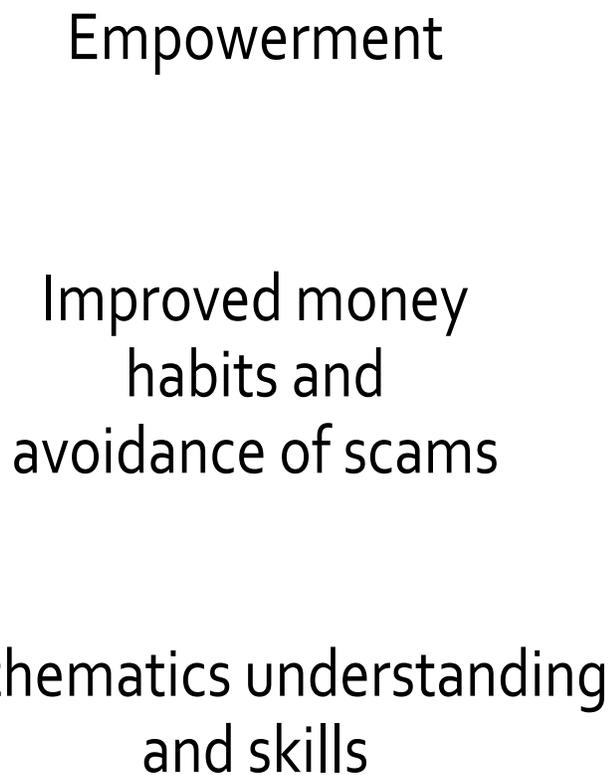


Figure 6. Path Toward Empowerment in the Money Club

Chapter 5: Discussion

Explanation of Findings

The purpose of this study was to understand the experiences of adults with DD and teacher of mathematics, how they reason, apply, perceive, and solve mathematics problems directly related to finance. This was investigated using a design experiment. In this study, four themes emerged from the data corpus, or all the streams of data within the study: problem solving of applied mathematics; money habits; scams; and ultimately empowerment of the individual.

The data suggest that (a) Not only can adults with DD learn the basics of algebra when applied to money, but also they can think creatively and solve problems using invented strategies; (b) The money habits of the participants in this study place them at risk for overspending and losing what little money the participants have; (c) Scams which negatively impacted the lives of people with DD was an emotionally charged subject and members sought support for the things that friends, family, and crooked businessman did to them; (d) Finally the empowerment piece can be attached to all of the three themes above, for many people in the group. When the participants overcame the obstacles in mathematics, money habits, and scams, they felt more powerful and in charge of their lives. Many of the participants felt if they could do mathematics, they could do other things that were challenging.

Money Club also became a safe place where adults with and without disabilities could work with each other, socialize, have snacks, and leave each night believing that they could do things that previously they could not. This study and the experiences of the participants

are strongly influenced by the impact the league for self-advocacy has had on these people including myself. This study speaks to the importance of high expectations of all people, that hard work will result in small improvements, and small improvements over a long period of time can create tangible habits, traveling with individuals as they move on to other challenges in their lives.

The study is important in that it challenges prior thinking that people with DD cannot learn mathematics beyond basic skills and because of these beliefs, should not learn mathematics at high levels and can learn only life/job skills. This study offers an alternative: People with DD can learn about both. They can learn valuable life skills, which we all learn, and also learn basic algebra skills that can apply directly to avoiding scams, managing money, and becoming more empowered and taking a stand for themselves. Life skills and algebra should be taught together; one reinforces the other. I ask, as I do in many situations that look for dichotomous, polarizing answers: Why can't they have both?

In this chapter, I will discuss the student and class themes, which were problem solving, money habits, scams, and empowerment. I then examine the importance of engagement in the student. Next, I analyze the instructional design or mathematics practices of the Money Club; this includes the teaching strategies and dispositions of the student. I then offer a description of each individual in the Money Club. In addition, I explain my experiences as teacher, teacher/researcher, and member of the Money Club. I will also reveal my implications for generalization of the findings of this study through the clarification of limitations, flaws, and the continued improvement of the teaching and learning of mathematics and money for people with DD and future research in this area as well.

Student and class themes. Student and class themes are explored and explained in this section. The participants' problem solving, money habits, scams, and empowerment of people with disabilities will be discussed here. The application of the findings within the Money Club in classrooms, community leagues, and other areas where teaching of mathematics and finance are needed are noted.

Problem solving. Two distinct ways of solving problems emerged in this study: invented strategies and following the standard algorithm. Participants used standard algorithm when they lacked confidence as evidenced by negative self-talk, sheepish verbal answers, and avoidance of participation in discussion. They employed invented strategies for solving problems when they were supported and only after they had solved problems correctly. The invented strategies piece of an individual's problem solving was highlighted by Baroody (1984), during his work with a child with a disability learning basic number sense.

When participants felt the group accepted them unconditionally and when they were successful at other mathematics problems numerous times prior, they could invent strategies for solving problems themselves. Sometimes the type of problem they solved prior to inventing strategies was not similar in nature to the problem for which they solved using invented strategies. It mattered more that confidence emerged from successfully solving a mathematics problem, which transferred to bravely taking on another one in their own way. Knowing the group would cheer them on, support them and be in their corner all the time created a risk-taking environment that is required when individuals think creatively and solve problems in their own way. Failing at prior problem solving and not knowing how others

would react to their answers, drove the members in the Money Club into a safe and standard way of solving problems.

In addition, one to one instruction did not encourage any invented strategies from emerging after this type of teaching strategy. For example in Class 2, all the members were confused and lost confidence during a price comparison exercise. They looked to me to teach them individually. I became frustrated as well,

When students need one to one instruction they are experiencing low confidence and just want a safe way to learn the mathematics or catch a break so they can continue to participate in the class, but will not step beyond into the realm of invented strategies. I conjecture that perhaps the reason for one to one instruction having the least impact on the individuals in the study could be explained through Flow theory (Csikszentmihalyi 1989, 1990; Sheifele & Csikszentmihalyi, 1995; Shernoff, Csikszentmihalyi, Schneider, & Steele-Shernoff, 2003). The individual is not struggling independently through a task slightly outside their comfort zone and therefore will not work through this to enter the state of flow necessary to reorganize their minds and feel the rewards of their toil. The student may think they were given the answer or the teacher did the work.

Mathematics anxiety spikes when students feel that they cannot solve the problem. They shut down and doubt that they can overcome this; they begin not to participate and slide further behind the class. This avoidance due to failure compounds as time moves on increasing the math anxiety (Hembree, 1990) For example, Antonio's participation in mathematics improved the more he felt supported by his peers and me. He would continue to work out his mathematics problem in front of the group as long as we did not get impatient

with him, which would trigger him shutting down. By Class 7, a tipping point for many individuals in the Money Club, he was able to solve the 3 folds /1 cut problem, stating that he would have 9 pieces left (1:46:46, Class 7). He may not have been able to invent strategies that I could discern, but he still needed the unconditional support of the class to continue with his mathematics problems and begin to build confidence with repetition to continue to participate in the class.

Invented strategies are ways of solving problems and supports for solving problems. Invented strategies can help the student remember how to solve problems, because it is in their own colloquial language and with their specific understanding of the mathematics problem (Baroody 1984). Inventing strategies can become burdensome and should not be used with every problem, just as reinventing the wheel can take more time than it is worth. It should be a way of getting a deeper understanding of the problem and then helping the individual solve the problem. It is also a way of increasing conceptual understanding, finding new connections to the same idea, and building capacity within the individual (Hiebert & Carpenter, 2005; Leamnson, 2000).

Sometimes, nevertheless, it should be noted that using standard algorithms, after a deep understanding of the problem or concept is achieved, can be an efficient way of getting to the right answer. Repetition also builds capacity (Jensen, 2000; Taub, 2004) For example, after understanding that $\pi \sim 3.14$ is the diameter wrapped around any perfect circle 3 full times with the remaining $14/100$ portion of the diameter added to complete the circle; the individual can then plug in 3.14 to solve any problem involving circles. Deep understanding

of a concept will be followed by an efficient algorithm that can often be one that has been used by mathematicians for many centuries.

Peer models with disabilities. The second theme, peer models with disabilities is important to discuss here, for in past studies the peer model is often one without a disability. Many of the members of the Money Club, were not educated with non-disabled peers for most of the day when they were students and were not exposed to peer supports from people with disabilities. The absence of peers without disabilities in the Money Club did not limit their ability to learn leadership and great teaching skills. In fact, I have seen since they continue to work with their disability, they are experts at helping others overcome similar barriers. Their expertise in working within their disability has become their strength in teaching others to do so.

The three peer models with similar disability, Helen, Lynne, and Wes that I identified in chapter 4 used their experiences living with a disability to help others. They know what it is like to overcome obstacles in learning mathematics and could use that struggle to teach others. They were patient, yet firm with the other members, often pushing them harder than I was, and had the credentials that I did not, to do so. They had personal relationships with the other members and a history of working with them that gave insight into times when they truly were struggling and needed a boost; they were not working up to their potential and needed to struggle alone; or when they were off task and needed a firm hand. Helen especially was adamant about not giving answers away and “making them earn it.”

I saw these three participants develop into great peers as well as expert teachers. New teachers in the arena of special education will, with the best of intentions, make problems

easy for people with DD. They will make them so easy that the individual will do little heavy lifting themselves. A pattern will develop where individuals will begin to expect teachers to give them all the answers, this takes many years to untangle and fix, which Zull (2002) emphasized as the power our past experiences have on our present choices. After years of doing this, teachers might begin to question their teaching and start to leave the heavy lifting necessary to learn to the student with DD. The peers with disability brought all their prior experiences and decades of living with a disability and worked more effectively than many teachers or nondisabled peer tutors. They have walked the path and are best equipped to teach others to walk it as well.

Supports. One to one direct instruction was the least effective, whole group was the most consistent, and small group instruction had the most variation in success depending on what peer leader was running the group. I began to document this pattern beginning in Class 1 (p. 6, design notes form) and it continued throughout the Money Club. Structuring a continuum of supports ranging from concrete to abstract, often utilizing many supports throughout this spectrum at once, can help those with DD learn mathematics. More importantly, the study found that ‘front loading’ concepts, or slowing down instruction in the beginning to improve or speed up the learning later was seen as a great support for the participants in the design notes form and after listening to the taped class sessions. Front loading was influenced by Claxton’s (1997) idea about ‘slow knowing’.

The continuum of supports is like a train running down the track toward a destination. Some people need concrete supports to reach the destination and get on at that stop; others benefit from auditory processing in larger groups and get on there and begin to pay attention.

In the Money Club, every student got supports ranging from concrete to abstract, whether they needed it or not. If they did not need it, they got a review of the underlying concepts so that when they did get to a challenging mathematics problem they had that to help them out as well. The combination of challenges and supports is the underlying concepts behind the works of Zull (2002) and Taub (2004).

Front loading of concepts allowed the individuals to ease into problem solving (p. 50 , 83, design notes form) I got to explain in detail and in multiple ways what we were doing and why. I have spent as much as 30 minutes explicitly stating what we were going to learn and why, baiting the audience into participating by asking questions. This allowed me to bridge (Brenner, 1998) the participants' prior knowledge to the mathematics specific language I was teaching. It alleviated the anxiety that we all have in doing new things in front of a group. Once they knew that we were in this as a team and we were only successful if everyone is on board, did the lesson go well. Investing this much time in the beginning of class paid off throughout the class by giving them supports, building communication, and increasing participation as a group.

Money habits. The money habits of the individuals in the Money Club were important in this investigation because they gave me a lens through which to look at what mattered to them and design lessons to meet their needs. I began this club with many pre-conceived notions about what needed to be taught; notwithstanding, the specific lessons on money habits came from the daily interactions with the group. While writing this, the organizing of the habits into three main codes (Impulse Buyer, Gambler, and Squirrel) enabled me to look at the common habits of very different people and investigate ways to

help them in the future. The idea that this category of money habits is constantly being reinforced by present choices of the individual underscored the importance of this theme for people with DD (Kim and Choi, 2007).

By using codes to describe the habits of those in class, I could quickly indicate what supports they may need in financial matters and mathematics, tendencies they may have in the use of money, and what strengths and weaknesses come with each category. For example, impulse buyers need to be made aware and develop strategies to curb the urge to spend on sight. They may need to shop without any money and write down what they want so they can analyze their potential purchases later and decide if they would be a good idea. Often once impulse buyers leave the store, the urge to buy that specific item subsides, saving them money. The gamblers need to realize on a deep level that they lose money every time they go into a casino and that perhaps, they can save 10% of their monthly money to go to casinos as entertainment, knowing full well that they will get nothing back. The squirrels need to be encouraged to spend on items they need, so as to avoid exceeding the \$2,000 savings ceiling. Ravn, Schmitt-Grohe, and Uribe's work on Deep Habits (2006) indicated that this theme regarding buying habits may be deeply ingrained in the individual and requires a long-term commitment to change. Many programs have taught individuals how to make change and spend their own money (Xin, et al., 2005) and money skills (Browder & Grasso, 1999; Morse, Schuster, & Sandknop; 1996; Xin, Grasso, DiPipi-Hoy; & Jitendra; LaCampagne & Cipani, 1987); none have dealt with the root problem - money habits.

Scams. Understanding what scams to which the members of money club were most susceptible to was the biggest shock to me as both a teacher and community member. I often

see low level scams on billboards, TV commercials, newspapers, at the state fair, and other big events. I grew up watching the Hall of Fame Yankee shortstop, Phil Rizzuto for *The Money Store*, tell me that I could obtain “quick approval” on a second loan by calling “1-800-loan-yes!” I would sit there thinking that a second loan would be a great idea and often wondered why my parents did not get one. So, I thought if I was believing these scams, I would see most members being taken by total strangers without personal ties to them as well, I believed it might be easier to take advantage of a stranger, than someone they are close to, especially if they are as charismatic and believable as Phil Rizzuto. I figured that these commercials would successfully prey on the “most vulnerable” (Lewis, 2008) and the “working poor” (Rivlin, 2010) which many people with DD qualify. While I saw some of these scams affect the group, most often the scammer was a person who knows them well – a family member, a friend, or an agency – which is the most dangerous.

Some people close to the Money Club members saw the opportunity to take advantage of the persons with DD because they knew the financial situation as well as their banks. Some believed they had a sense of entitlement that the person with DD owed them something just because they had a close relationship and if they did not receive what they deserved, they felt justified in just taking it. Others acted on the perception of what they thought the person “needed” to live well in the community; they may decide that the money was not needed and just take it. Some saw themselves as guardians and “borrowed” the money with the intention of paying it back, much like parents borrowing from their children’s college savings. For example, Abel (1990) explains that people tend to look at the gap between themselves and their neighbor and look to improve upon their situations at the

expense of others. In all of these situations, the individuals with DD were taken advantage of by people they trusted. This causes temporary financial damage, but also long term emotional damage to victims. Nevertheless, many advocates see the importance of scam avoidance whether by those close to the individual with DD or a complete stranger, as evidenced by “project 2015”, aimed directly at scams on the elderly and those with disabilities (Prosper, 2011).

Empowerment. The perceptions of those in Money Club about mathematics ranged from boring to easy to fear inducing. Many of the members were insulted by their prior experiences in mathematics in grade school, learning the same basic mathematics over and over, never getting exposed to higher mathematics concepts and skills. Dispositions regarding mathematics and life were coded as passive, aggressive, positive, negative, victim and self-determined. The use of self-determined peer models in small groups helped not only in participating in mathematics but also in the overall disposition of the groups. An improved disposition led to increased engagement in groups. The distinction in the engagement levels between one to one direct instruction, small group and whole groups were explored.

The perceptions that each individual came to class with were changed as a result of the Money Club, learning from past actions and displaying brain plasticity in that memory and experiences are constantly constructed (Hiebert & Carpenter, 2005; Jensen, 2000; Leamson, 2000; and Taub, 2004). The differences between the pre- and post-interviews were especially revealing. The members seemed to appreciate the types of problems they were solving and that they were expected to do the work mostly by themselves. This is reminiscent of Flow (Csikszentmihalyi, 1990). The onus was on them and for the most part,

they rose to the occasion. If I were to engage in remedial work in future research or teaching, I would continue to do what I did in the Money Club – devote the first few classes on the basic facts then jump right into applied algebra. The seemingly quick jump to algebra is necessary to avoid complacency and to stay away from the perception that the class will be the same old thing they are used to in mathematics classes. They need to know that (a) I will support them and (b) I will work with them and expect that they will contribute to the class in ways that may be a little outside their comfort zone.

Dispositions change over a long period of time, if at all, possibly due to the emotional involvement of such dispositions (Zull, 2002). To overcome negative or complacent dispositions toward mathematics, students need sustained instruction and successful performance early and often. Using peer models with disability was the most effectively employed strategy to change dispositions toward mathematics. Each small group needed at least one individual who could be categorized as self-determined to keep the group working. Identifying them early in the class will help teachers manage negative and aggressive dispositions toward any subject they are teaching. Too many negative individuals in a group can be a cancer to the group. Separating negative individuals and pairing them with a self-determined peer can ‘cure them’ of this cycle of negativity or complacency. Positive and negative feelings are temporary and can change as the day goes on like the weather; dispositions are more like climate and may take a long time to effect change in the individual. Certainly, a self-determined individual is a powerful force in any group and can expedite the ‘climate change’ teachers may be looking for in class. Helen, Lynne, and Wes were the

generators of their lives and moved others toward their ways of thinking and acting in the Money Club.

Engagement. Engagement was most consistent in whole groups, had the most variations in small groups, and was increasingly absent the longer I engaged the members in one to one interactions. I had the most control over whole group instruction and was able to adapt to the needs of the class instantly and script more of the outcomes. I also had three peer models ready to answer questions or guide others to solve problems. In small groups, the level of engagement was directly linked to the peer model and also to how effectively I taught the lesson previously. Spending a lot of time driving the concepts, initially began to pay off in small groups. When I did not teach well or rushed instruction, the small groups could not operate with what I gave them. They needed a lot of re-teaching, which lowered engagement especially in the groups that had to wait for me to get to them. One to one instruction was initially effective as long as I walked away immediately after giving the member a conceptual “Jump start” (p.28, design notes form). If I stayed on too long or for more than a few questions, engagement decreased and the individual leaned on me to do the work. This may be explained by the challenges Taub (2004) found with his patients employing underused or neglected area of the brain to force reorganization and improve synaptic connections, sustaining successful rehabilitation.

An explanation for the “law of diminishing returns” effect on one to one instruction may date back to when the individuals of the club were in grade school. I see far too often, and the participants verified this as well, that school teachers and EA’s ‘dumb’ tasks down for students so that they can move on to the next activity. Teachers want to see them succeed

so they temporarily help them be successful by doing a lot of the ‘heavy lifting’ for them. This brings temporary success because the teacher reinforces the idea that people with DD cannot do things for themselves; teachers will need to continue to do most of the work, because now it is what is expected.

Finally, a conjecture I developed throughout the Money Club was that when I engaged a student in one to one instruction, I was in essence, living out this past pattern of dependence within the students. The longer I stayed, the more they identified me with their prior teachers, and present engagement decreased. I needed to emphasize that each student could carry the weight of learning and to push them to do so at all times. One to one direct instruction is a technique that can be effective in small doses and needs to be employed with caution when teaching mathematics to adults with DD.

Instructional Design: Mathematics Practices

Teaching strategies. The teaching strategies that I found most effective with the people with DD in the Money Club are: (a) driving conceptual understanding with the support of a mathematics model, (b) positive comments regarding mathematics attached to clear redirections for improvement, (c) in whole groups: steady and deliberate speech underlying the concepts first, skills to follow (d) followed by small groups: quiet until they get it right – then explosive and animated when they solve the problem and encourage talking and (e) when trouble arose – brief one to one tune-ups with quick release to the small groups.

Driving conceptual understanding with the support of a mathematics model grounded every lesson I taught, which is encouraged by cognitive mathematics research (Hiebert & Carpenter, 2005). After the disaster that was Class 2, I increased my time spent in this area to

avoid this from ever happening again (p.12, design notes form). When I talked about concepts with a prop (broken rulers, string, blocks, ect.) or drew pictures of the concept on the big board and just talked about it and encouraged conversation, the lesson would begin to gain traction. The mathematics models would become talking points to stimulate discussion, where I would ask questions such as, “If we broke these rulers and you had to take one piece and toss the other in a pile with all of ours, how would you know if you found your missing piece?” (16:02, Class 10) The people would have to give me as many ideas from concrete to abstract. I would then demonstrate one way of solving the problem and ask for other ways from the groups. For example, Amy and Brian used different operations for finding the missing piece of the paint stirrer when we broke them. Amy thought that adding the two pieces ($23 + 30 = 53$) after finding one that looked like they matched and eventually found the right one, while Robert took the whole measurement of a joined piece (53 cm) and subtracted his piece (23 cm) to know that the missing piece must be 30 cm (16:02 – 17:30, Class 10). They had to find an alternate route to solve the problem.

Teacher dispositions. The disposition that I thought was the most effective for teaching this class was no different from how I typically take on teaching my high school classes: high expectations, constant positive reinforcement, and a relentless shaping of proper learning behaviors in my students provides a backbone to any program. These beliefs, thoughts, and decision-making were consistent as in my everyday teaching (Klosterman, Raymond, & Emenecker, 1996). I set up as many opportunities as possible for initial successes in the beginning of the year and as the curriculum gets more difficult and the group starts to bog down, I have to pump them up to get them to believe in themselves and get back

to work. Setting the stage for many successful moments for the students while keeping the weight of learning squarely upon their shoulders is a deliberate balancing act; it must be adhered to in order to demonstrate to the students that they indeed worked for their success and do not need the teacher.

I also hold everyone accountable to learn and live by my mantra on the wall: Be here, be on time, work hard, no cell phones. Simple, easy to understand, and I can remember to enforce consistently. The difference between the Money Club and any teaching I have done in my career is that each student in the Money Club did not have to attend any of my classes and no grades were given. Their attendance was optional - show up at any time and leave at will. I thought they would enjoy the class if they stayed, and spent many hours preparing the interesting and emotionally charged lessons to engage them. I also made sure to ask them questions about what they wanted to learn and focused each class on them.

Sometimes teachers have to negotiate some of their teaching preferences to be effective, which brings to mind sociomathematical norms literature found in Chapter 2 (Cobb et al., 2001; McClain & Cobb; and Steffe & Kieran, 1994). I had to rein in my natural tendencies of wanting everyone to be on time, which is probably my most obsessive quirk, in order to teach the class well and keep them coming back. For anyone who has entered any of my classes in the past 12 years this is no small issue. With every person who showed up late, I painfully bit my tongue and welcomed them to class. They would respond with, “sorry I am late” and as the class went on, they came to class on time more often without my pushing the issue, but I think even with the best face on they knew lateness bothered me. I may have led the class in development of sociomathematical norms, yet had to adjust to the class for it to

work. Being the kind people that they are, I think they showed up on time to make me happy, and I was.

How they learned best. The individuals in Money Club learned best in small groups, taught by same disability peers, on emotionally charged subjects, only if I clearly modeled and slowly drove concepts in the early parts of the class. I purposely slowed my talking and methodically explained everything allowing the members to understand the concepts, with just enough help for them to take off with the work, then they could move on to small groups with few problems. If I rushed this beginning process, the small groups would struggle and I would have to revert to direct instruction. By doing the “tough” preparatory work (Hall, 1996; Glassman, 2001b), I was able to better support them learn mathematics. I also saw that the better I got to know them, the better a teacher I became – writing daily in the design notes form specifically about how as students were learning forced me to increase the degree slope of my learning curve helping me become dialed in to how they were learning and what support I needed to give them.

I also found that three of the individuals (Helen, Lynne, and Wes) could independently understand and apply basic algebra concepts and skills. The others could do the work in groups and alone with success, just not with automaticity as these three. They learned to invent strategies for solving problems only when they felt confident in their mathematics skills and supported by their peers. Risk taking in groups was preceded by a sense of competence and feeling of acceptance by their peers, which is important since many people with DD are not able to take risks (Perske, 1972). As the weeks passed within the club, many of the members became more confident and began to solve mathematics problems

at levels they previously thought they could not. The ‘Come for the snack, stay for the mathematics’ phrase became a working definition of what we did as a group.

As the concepts and skills became harder, they tested the mental toughness of the class and their ability to trust me as a teacher. I had to support them more and praise them more often for them to walk in to the unknown: Algebra. Many of the members after just hearing the word looked stressed out and we had to have many group empowering conversations to get them to keep working. The combination of challenge and support found in the work of Zull (2002) and differentiated mathematics instruction as found in the Work of Kozulin and Gindis (2007) helped them to continue to work. Often I would do an algebraic exercise then tell them that we just did Algebra and they would respond with, “Oh Boy” (9:34, Class 9). I then reminded them that they would have to do harder algebra problems and received this response. “But Algebra is the hardest thing in mathematics to learn” (10:04, Class 9). They would lock in and participate in the next lesson. Sometimes just talking about their fears could alleviate them, pushing them past them to continue to learn new things.

Teacher

In this section, I will explain my experiences as a teacher and teacher-researcher within the confines of the Money Club. I was both a member and organizer of the club. In the following paragraphs I will discuss what I have learned and how the Money Club has deepened my understanding of people with DD, mathematics, and my own teaching.

Teacher-researcher. The utilization of design experiment as my methodology was appropriate in this study. The organized and precise embedded steps in the methodology,

helped make sense of what was happening in the club and forced me to explicitly cite all the action within the classroom and offer explanations while the study was happening. The constant documentation and explanation also mirrored what many in special education are used to in the classroom for legal protection and constant improvement. It required me to engage in sustained reflection in order to deeply understand the learning in the classroom (Dewey, 1938, Hall, 1996, Kolb & Kolb, 2005) Design experiment methods quickened the learning curve in getting to know my students, and learning their strengths and areas in need of improvement. Subsequently I became a better teacher faster than I would have typically within a school year.

Further, I realized that teaching is a constant readjustment of the weight on students' shoulders. As the class changes and skill levels adjust to the curriculum, the teacher must continue to adjust the level of complexity to continue the growth within each student, which is aligned with Flow theory (Csikszentmihalyi 1989, 1990; Sheifele & Csikszentmihalyi, 1995; Shernoff, Csikszentmihalyi, Schneider, & Steele-Shernoff, 2003). Each night when I went home to write up the design notes form, I would think of how each student was progressing and I would listen to the tapes to verify my conjectures. The next day I could then write a lesson plan with the supports necessary to meet the learning needs of the members of the club. When the work was overwhelming for them, I had to adjust the supports without watering down the content. When the work was coming too easily, I made operations more complex or assigned members as group leaders to teach others. Finding the perfect balance of challenge and support was an ongoing and daunting task. In the end, I

found it worthwhile watching them solve basic linear equations and understanding what the graph was doing.

Affirmation of the fact that teaching is hard work came daily for me in the Money Club. Being able to do mathematics well is in no way a given that a person will be even a mediocre mathematics teacher. I constantly struggled with groupings, supports, and designing the perfect lesson. Even when things were going well, I was critical of my teaching and questioned the success of the club. Almost every day I left exhausted, overwhelmed, and unable to think of anything other than the mistakes I made in the class. The everyday problem solving forced me to reflect upon my teaching (Rorty, 1992).

I learned that when this kind of pressure mounts, I need to lean in and push through to reach the good ideas, possibly entering a state of flow (Csikszentmihalyi, 1990), were just around the corner. Getting to good ideas in instruction required me to fail early and often, but to continue to stick with it. Sometimes later that evening I would come to a decent idea on instruction, supports or groupings. Good teaching ideas do not come easily and are hard earned, making the feeling of accomplishment that much more enjoyable. For instance, Robert, who is engaging and at times extremely talkative to the point of disruption, was not working up to his potential during the first two classes. I utilized his talent for entertainment by asking him to volunteer for all the mathematics modeling in the beginning of class. He was the center of attention anyway; I turned the focus on my mathematics problem for the group and he was engaged in doing the problems. It worked; the class was entertained and he got his time in the spotlight. I also believe they learned more than if I was the center of attention.

Another way of combating the inevitable stress associated with teaching is intricate planning. Planning was a buffer from the stress and a path to teaching freedom in the classroom. With a solid plan in place, I could focus on the learning and group dynamics. It also gave me the time to adjust the difficulty of the learning on the fly knowing that I had a well thought out plan to support me. While Glassman's work (2001), specified that the planning of the class supported the students learning I see the benefit of planning for the teacher. I could not plan for everything (Tracy's meltdown and Eddie's bullying) but a detailed plan allowed for the unknown to happen without losing my cool in class. It was my ship, allowing me to navigate the sometimes disruptive environment without drowning in the classroom. Extensive planning saved the club.

The last key support for me as a teacher researcher was the deliberate slowing down in the beginning of class to develop a concept thoroughly. This helped the small groups run the rest of the class. This idea of 'slow knowing' was developed by Claxton (1997) to force an individual to sit with and study an idea and breathe a little in order to deeply understand something very complex. Slow knowing is meant to instill patience with the inherent confusion within a complex problem, reduce anxiety and begin to work out a solution. I utilized this idea as a component of 'front loading' each lesson (Lesson plan 7). We took as much time as needed to understand the complex nature of the concepts we were studying before moving on to small group and independent work. It may have been my favorite support in the classroom.

In fact, there was a direct relationship between the time I spent teaching the whole groups which influenced the range between the classes that were not learning very well

(Class 2) to the ones that did (After Class 7). The time spent in whole group instruction paid off in most areas of the classes, by reducing their dependence on me as their teacher. I could slowly work out an idea with the class, this lowered their anxiety levels and allowed them to settle into the learning. Once I knew that the class was with me, I could adjust the work and set up the groups. They needed less one to one time with me, and became more independent, which was my main goal in teaching.

Teacher as a member of Money Club. I also felt as if I were a member of the Money Club. The feeling of teamwork or co-construction of learning (Popkewitz, 1998) within groups was tangible and I saw a clear sense of community. I felt that all the members took care of each other. They were able to argue and fight fairly within groups with the main objective of getting better at what they did. Snack time, when we shared food, became a relaxed learning environment where we could discuss other important issues. Both before and after class there was always someone helping me set up or put away equipment or mixing up a batch of lemonade and iced tea. I realize I was the teacher, but often I felt like a team member as well.

After one particularly difficult interaction with Tracy, I was regrouping to push through until snack time and I noticed the looks on the participants' faces. They looked worried for me and seemed to want me to go back to my normal self. For the rest of class each one was trying his or her best to work hard, not argue, and help out at levels I had not seen before. They kept telling me "Do not worry, she acts like that all the time." During this time of high stress, they started to take care of their teacher. If there is one instance that I will personally remember of the Money Club it was the kindness they showed me.

Implications

Within this study, I found that through the experiences of the Money Club, the specific beliefs, perceptions, and classroom actions of participants slowly changed. The experiences of the participants were captured using tape recorders placed strategically throughout the classroom. Utilizing a design notes form, which methodically documents the actions and experiences within a classroom, as well as pre and post interviews I was able to triangulate data, code and find themes to describe some of the experiences (beliefs, perceptions, and classroom actions) of the participants. These themes included: Problem Solving for People with DD, Money Habits, Scams, and Empowerment. I also found that not only can students with DD invent ways of solving problems; but also they will rise to the expectations of their teachers and learn basic algebraic concepts and skills, when specialized supports are in place. Examples of specialized supports include support by a peer tutor with same disability, developing conceptual understanding followed by procedural skill instruction, using mathematics models, directly applying mathematics to common financial scams, and similar supports. The participants were affected by the interaction with same disability peers, the classroom instruction and specialized supports, and their own successes and failures in the Money Club. These experiences influenced how they felt about themselves, their orientation toward mathematics, and added another layer of empowerment to their lives.

I also found that the design experiment methodology used in this research, aligned strongly with brain research that focused on a complete learning cycle (Zull, 2002). After completing the research, I found both to dovetail. For example, the four components of a

complete learning cycle and the corresponding components of design experiment are *concrete experience* (teaching of the Money Club); *reflective observation* (daily completion of the design notes form; *abstract hypothesis* (developing conjectures on learning, supports needed, and teaching); and finally *active testing* (lesson plan writing informed by prior teaching). This process forced me to improve as a teacher and begin to meet the learning needs of the people in my 'club' by expediting the learning process with daily reflection and hypothesis generation.

Generalization. *Adults with DD can learn basic algebra concepts and skills with supports.* They can apply algebra to financial mathematics with diverse and robust supports that are adjusted daily to ensure success. They can estimate what will happen in a pattern as Wes and Lynne expertly did in class. They can apply what happened before to what is happening in the future as evidenced by the class' application of Lynne's "½ of a ½" invented strategy for solving problems. By using the technique of first teaching a conceptual understanding of algebra (Fuson et al., 1997; Hiebert et al., 1996; Lampert, 1986; Miller & Mercer, 1997), I was able to empower the peer leaders to run their own small groups later in class.

The core supports necessary to learning algebra for this group of individuals with DD were methodical explanation of concepts with employment of mathematics models followed by repetitive skill practice in applied settings; identification of peer models with disabilities; and extensive planning for daily changes in the skills of participants. Developing lessons that are of personal interest to the individuals in my group, and that tie into finance and algebra were critical in engaging and increasing participation in the Money Club. Listening to the

tapes allowed me to stitch together how the class was going and developed a clear picture of what they wanted to learn.

Adults with DD can invent their own way of solving mathematics problems. Lynne developed an invented strategy (Baroody, Ginsberg, & Waxman, 1983) for solving problems involving fractions with even denominators. Her ‘half of a half’ strategy worked for fourths and eighths and will continue to work for most fractions including odd numbers ($\frac{1}{2}$ of a $\frac{1}{3}$ is a $\frac{1}{6}$). She claimed to have just thought it up in her head and at the time was not sure she was doing the mathematics correctly (p.39, design notes form). This is an example of how surprising it felt to have thought of a unique way of doing something and having to go back and check it to make sure it works. It was engaging to test out her idea and find that it continued to work. It also increased her participation in other areas of the class. After solving one problem well she was confident that she could continue to solve others well. I cannot state enough how initial successes can create momentum giving students confidence to continue to work on challenging problems. Inventing their own way of solving problems gives them more confidence.

Wes and Helen were able to see the answers “in their minds” as found by Fuson et al. (1997) to the one and two step algebra equations and used markers so that they could work on the next steps. They adapted to the problem and allowed their own working memory to focus on one thing at a time by setting aside one answer to go after the next within one problem, then combining the two to get the complete answer to (x). I did not teach them this. I modeled the concept of tying and untying knots, breaking and joining to explain how we find out the missing pieces. However, they not only invented a way to solve the equations, but

they also gave themselves a cognitive support of organizing and setting aside partial answers so they could focus on each task on their way to solving for (x).

Adults with DD when challenged will rise to the level expected of them. As I have stated before many of the members were insulted at how they were taught mathematics in grade school. Nonetheless, they were also afraid of algebra, believing it was outside of their ability levels, never to be learned. When the environment was supportive and the initial pace was slow, applying moderate pressure yielded results, which is consistent with the work of Jensen (2000). The members needed to be able to make mistakes and not be made fun of. These mistakes had to be a cultivated part of class to allow them to grow. Students will not take risks when they are self-conscious. Mathematics is known to be an anxiety-producing subject. The teacher must address classroom anxiety often. The floodgates for learning will open as found in flow literature (Csikszentmihalyi, 1990) when students are comfortable with each other and able to work through ideas together.

As I have stated early and often in this research, direct instruction is a trap, especially for people with DD, who have been taught in this manner for decades. This may be explained by Miller and Mercer (1997), for when in one to one instruction the teacher not the student is taking control of the learning. Teachers should use it for short bursts to support the students, then move to a new group. Too much direct instruction made the student lazy and the teacher felt hopeless. At first, when I quickly helped then walked away, the members may have thought that I was unkind and unsympathetic, but I always left them with an encouraging word, for instance: “You got this,” “Struggling is good for you,” “Work on this and I will come back and check on you,” “I know you can do it, go after that problem.” The instances

of direct instruction decreased with each class, and it was beneficial for the individual members and the entire class to know that they can do well without my help.

Money Club was successful because it was fun and challenging. I came up with a slogan during the Money Club “Come for the snacks, stay for the mathematics.” I meant it. The importance of snacks in any community building activity can be vital to its success. I wanted, from the beginning, to build a sense of community and togetherness. In my history this comes from eating together. Most people invite only those they like to their homes and the sharing of a meal is a bonding activity. I wanted the members to learn mathematics and financial matters in the Money Club, but I wanted to build a team that relied on each individual’s participation and attendance each week as well. The Metropolitan League of Self-determined Individuals was a natural environment where the members felt comfortable. I was fortunate to use their space for the six weeks I was there. Finally, people in the Money Club wanted to be entertained while they learned and I was told by the director of the league that they would not show up if the club is not fun. I had to keep this in mind at all times.

I also had to keep in mind that many of the members of the class had histories of low expectations of them in mathematics. I had to continue to place the members in high-pressure situations and to push them to work through their times of frustration without bailing them out. I still think that each time they solved a problem that they initially had given up on, it built up their confidence and gave them the guts to continue to solve new problems. Mathematics may not be their ‘thing’, but I made sure to work toward getting them to believe that it is an important tool in understanding the world of finance and that nothing worthwhile is easy.

Limitations: Formative Evaluation

Within a design experiment, the researcher must account for the following types of limitations in order to improve in the future in both design of new study or extension of prior studies.

Limitations for replication. The first limitation in replicating this study lies in the lack of a co-teacher who could have acted as a critical friend in the design, instruction, and actions within the mathematics classroom. As found in Cobb et al. (2003), it suggests that when teaching a full class, a second teacher/researcher should be used. It would have been useful to have a second set of design notes forms to compare to during the analysis of the data corpus.

A second limitation is in my time spent as a teacher for people with disabilities over the past 13 years. The techniques I have learned and experience in the classroom impact instruction. In addition, through my experiences I have developed supports for learning mathematics, which may have been of benefit to the people in this study. A future researcher replicating this study would ideally have spent a lot of time teaching similar students and learning from the mistakes that come with teaching.

A third limitation is that each and every person in this study volunteered to be a part of the Money Club. They were not forced, coerced or talked into being a part of the program, which speaks to the impact of a group of people who commit to something vs. mandatory attendance. In most classroom settings, grades are tied to attendance. In the Money Club, the participants attended to learn a skill with no grade attached. The commitment and motivation to attend may in fact have influenced the results of this study.

Finally, the ethnicity of the participants of the class bears explanation. The class' ethnicity was made up of 5 Caucasian, 2 Mexican American, 1 Hispanic, and 2 of mixed ancestry of Hispanic and Caucasian.

Implementation flaws.

Technology concerns. The Metropolitan League of Self-determined Individuals has a SMART interactive whiteboard, set up in the front corner of the main meeting room. I was encouraged to use it throughout the first few classes. I brought my own whiteboard that I built out of scraps left for recycling at my high school (window with metal mesh, TV stand, and angled metal), that I use with my high school students. It is an easily movable writing surface for teaching. I was comfortable with my own board and brought it to use in the league.

I decided to use the available technology instead. However, the technology came with its own set of problems. These problems arose almost immediately, the board would abruptly shut down, and I had difficulty switching between windows. The PC used to power it was using an old version of Windows and was very slow. The system administrator blocked certain sites that she deemed inappropriate. However, we needed these sites to find information on scams. All of these issues, became instances where the class would laugh and enjoy watching me dramatize the situation. Although, we lost only a few minutes here and there of classroom time, and required even more time to get the class back to focusing. Technology that is more efficient or my original low-tech device would serve this purpose better.

A need for help. It has been suggested that a second researcher or assistant should be used in a design experiment that incorporates more than a few individuals (Cobb et al., 2003). I did not have that luxury and there were many times I could have used an assistant to offer criticism on classroom design, help with equipment setup and offer support in keeping track of the tape recorders. The teacher-experimenter and single student method would have been more manageable and less taxing than what I undertook and may have yielded better results. I do think that because I was working outside of my skill sets, I was forced to learn faster than if I had help; however I would in the future look for a research partner to run the experiment from the beginning.

Strategic Flaws. Strategic flaws are clear missteps in thinking through a method of attack for teaching a class. They occur when the researcher plans for something and it does not happen or he forgets to plan for something that emerges in the study that could have been avoided.

I took a class on self-determination that introduced me to the Metropolitan League of Self-determined Individuals two years before I conducted the study. I was paired with a fellow student and a member with DD. We worked on a training module titled “Getting Funding from the Legislature.” The league creates, practices and presents to people with disabilities around the state and as far as Saipan on the Mariana island chain in the Pacific Ocean. I initially wanted to develop training modules from the club and assumed that that would be a positive way to give back to the league. I planned that these modules would be the final product of the club.

The director of the League told me that they have so many training modules they need to scale back. The league would not need a major planned component of the Money Club. I learned to be explicit in talking to stakeholders about what they may need. Through this experience, cutting the training modules at first required me to spend more time planning, but in the end, it allowed me to spend more time teaching mathematics.

I also found that I need to modulate my speech to teach better at the league. I am from the East Coast and speak rather quickly. I was, on many occasions, asked to explain what I was saying. At first, I thought they did not understand the content of what I was saying, but after a while, I found that my blurring of words and slight speech impediment really confused people. I also could have done a better job of bridging their understanding of mathematics to the formal language of mathematics. For example, sometimes I allowed them to use their own words for certain mathematics terms. I could have used these times as opportunities to correct and bridge between the two words, but failed to do so.

Finally, I also became engaged in one to one direct instruction strategies for entirely too long during the first few classes. I reinforced past behaviors in my participants when I should not have done so. Without having much history with the participants in the first few classes, I took on work that the individuals could have done themselves. I also did not front load the class with concepts in the beginning of the club.

Another rule I would change in future Money Clubs is 'whoever starts the class with the group can continue to come to class: No late registration. I would also advise any League to advocate that everyone is welcome but not to feel as if they have to come to the Money Club. The two disruptive influences arrived in the later classes after I set up group norms and

expectations. They both claimed not to want to be there and felt that their caseworker talked them into coming. This was contrary to my explicit statement that the club was voluntary. This sense of coercion caused the members to have such aggressive reactions to the class and me. I did see one of the people who disrupted the class at a league function later that year and she asked 'Are we OK?', I said 'Absolutely, past is past' and we made amends.

Participation flaws. Use and protection of my cassette recorders was not an expected concern in the beginning of class. I was initially worried that the tape recorder would not capture the conversations of the group. After the first day, I adjusted the volumes and placements to hear what everyone was saying. I did lose about 20 minutes of class time on two occasions when Eddie and Alejandro shut off my tapes, Alejandro out of curiosity and Eddie in anger. Alejandro used one tape recorder situated near him to repeat phrases repeatedly and to amuse himself. All of this occurred without my knowing anything about it, until I caught Eddie and told him not to touch my equipment. I will watch and be more aware of people's proximity to my equipment next time around.

Continued improvement. After the conclusion of the Money Club, I felt a strong recommitment to the profession of teaching mathematics to people with disabilities. I truly loved working with the adults at the league during summer break. I felt a strong calling to continue to do so in the future. I also became a better 'shortstop', fielding questions from all levels of mathematics understanding and attempting to increase the students' concepts and skills. I learned about the knowledge of more than 12 individuals, their learning styles and what supports are necessary for them to be successful. I learned more about harnessing their talents as a collective team of applied mathematicians.

As a person, I continue to learn that nothing worthwhile is easy. Satisfaction comes from taking on challenges that are little outside of my skill and comfort zone. Flow is real and can happen in both the classroom and in research; research is a new frontier for me.

Future Research. The findings in this study suggest that adults with DD could invent strategies for solving fractions and basic linear algebra equations. The adults in this study when provided with robust and diverse supports such as mathematical models, concrete supports, and peer models with similar disabilities they could perform at higher levels than have been expected of them in the past. This study could be extended using the same members in a similar applied algebra course on finance or in another application of algebra course to mine the skills and understanding of the participants. This could build upon and extend this study and find new ways adults with DD solve problems, by improving the math problems, supports, and methods of instruction.

The findings also suggest that that the money habits of the individuals in this study were deeply imbedded and require a great deal of effort to change. Each money habit type is at risk for a different financial crisis. The Spender and the gambler are at risk for going into debt or losing all their money, which increases the chance that they will need and thus engage in predatory lending practices with pawnshops and payday loans. Although the squirrel may avoid the necessity of borrowing money from predatory lenders, they will run the risk of saving too much money, exceed the \$2,000 savings ceiling, and could lose all their SSI benefits. A study on people with DD who have either lost their SSI due to making too much or saving too much money would benefit people with DD. Tracking the purchases of spender

and gambler types, while offering a support group would help them avoid debt and bad financial decisions.

The findings also suggest that people with DD are subject to financial scams by those closest to them, who are aware of their SSI and financial situations the best, whom they trust and lose large sums of money to as a result. The findings in this area were the most surprising and need further review of and could be singularly studied in the future. The rise in internet scams and viruses, although not found in this study, is of concern due to its high prevalence in our country and the expertise used in mining for information. A frightening example is the Spear-Phishing, where peoples information is taken online by an embedded email, example in chapter 2, which could take advantage of virtually anyone.

The findings also suggest that the effects of successfully completing one task that you previously thought you could not, in this case algebra, can pave the road to empowerment and risk taking behaviors that lead to taking on future challenges. The individuals in this study felt empowered after completing a 6 week applied mathematics course called the Money Club. Many throughout and during the post interviews specifically stated that they were shocked at how much they could do in mathematics. This feeling of empowerment was tangible and inspired me to look at other ways to 'set the stage' for future empowering classes for people with DD. This feeling of empowerment happened because they know they were the ones doing the heavy lifting and completed the work. Considering this pattern, future work on the risk taking and hard work needed to achieve empowerment, even in small doses, might work for others with DD.

Finally, caution must be taken when examining the results of the Money Club. I do see that the individuals I worked with have been primed for success prior to this study; by their parents and the Metropolitan League of Self-determined Individuals. It is mostly the students who took advantage of the instruction, developed a tough disposition, and led others successfully; resulting in a great class. Another point of contention is not all people with DD have the type of supportive net as the Metropolitan League of Self-Determined Individuals; which the participants in this study work on and enjoy the benefits from. They were ready for a class like the Money Club, worked very hard and wanted to be successful, therefore they were. Future research in this area must include a replicated study with different participants to examine if an applied mathematics class in finance is viable or not.

Closing

The design experiment applied to the research in the Money Club was an ideal path to improved teaching and learning. It allowed students and I to struggle for meaning in mathematics in healthy ways. New knowledge was created within the participants and the teacher this will be a valued development in my future as an educator. Working through times of anxiety builds internal capacity within the individual and can be seen as a type of preventative medicine for anxiety knowing one has done it before.

The Money Club may have seemed like a training camp for teaching and learning. When I was in it, I was exhausted; but when it ended, we were all proud of doing something that we did not think we could. This experience can generalize to other situations where one participant may doubt himself and think back to what he accomplished in the Money Club. In closing, the work and methodology used in the Money Club, became complete learning

cycles for me and possibly for the group as explained in Zull (2002, p.40), concrete experience (teaching), reflective observation (design notes form), abstract hypothesis (developing conjectures on learning, supports needed, and teaching), and active testing (lesson planning) (see Figure 7). I appreciate the journey and am a better teacher because of it.

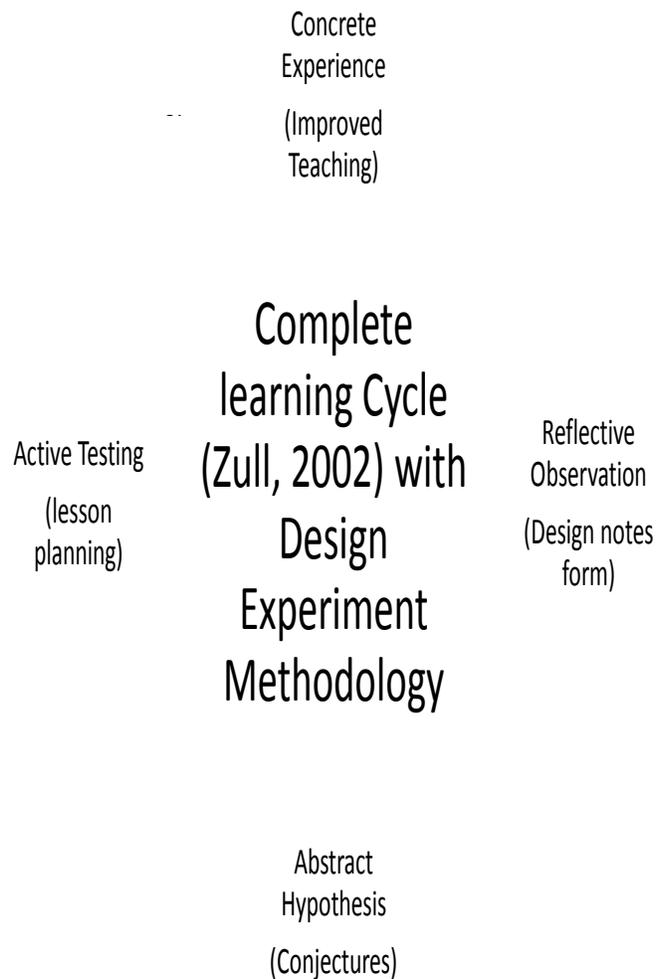


Figure 7. Comparing Complete Learning Cycle with Components of Design Experiment Methodology

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Appendix A

Pre and Post Interview Questions

(Adapted from Ernest, 1989)

Nature of Mathematics

1. I use mathematics to teach students, what do you think mathematics is used for?
2. When I say the word Algebra, what do you think of?
3. Tell me about mathematics in school...
4. What is mathematics like for you?

Models of Teaching and Learning

1. Let us talk about what mathematics class was like for you...
2. Some people think that budgets help people spend money, what do you think?
3. Tell me about your favorite subject in school?
4. How do you learn best?

Principles of Education

1. Tell me about how people learn mathematics?
2. Tell me about what was happening when you to signed up for money club?
3. What do you think of learning about credit?

Participants may not be able to answer all questions

Appendix B

Provisional Work Schedule and Curriculum Map

Prior to Week 1: Pre-Intervention Interview

The Advocates will be interviewed using questions attached.

Week 1: Developing Concepts

The Advocates will take pre-tests followed by an overview of the purposes of the class. The first two classes are designed to develop group dynamics, increase mathematics communication, and develop concepts of lending, purchasing, and financial matters.

Week 2: Discovery Learning With Supports

The mathematics club members will be given an assignment to search variable and fixed rate loans on the Self Advocacy Center's computers. They will be given an organizer to fill in 3 different fixed, 3 different variable loans with escalating interest rates. They will find the differences using simple interest and graph their results using Excel.

Week 3: Patterns Using Algebra

Mathematics club members will use function tables to organize data and chart basic changes in slope to predict future costs and gains in financial matters relating to different investments and loans. We will play with variables and escalators to demonstrate how small changes and costs can influence future gains and losses.

Week 4: Compounded Interest

Now that the group has eased into basic interest and patterns of interest, we can now show how money and debts compound over time. Can be more challenging as a concept than as an application.

Week 5: Saving, Investing, and Scams

The Advocates via the internet will find different common money making schemes(Ponzi styled) as well as well reputed mutual fund investments (Vanguard, Buffalo, T. Rowe Price). I will teach them the differences between savings accounts, money market, bonds, mutual funds, and stocks and the differences in rate of return and safety of returns.

Week 6: Project and Post Assessment

Throughout the project, we will have pieces of a training module saved and we will now put together the pieces for the league to use in the future while reviewing for the post assessment. We will then take the post assessment. If the module is not complete, I will spend the next week working on it with *the Metropolitan League of Self-determined Individuals*.

After Week 6: Post Intervention Interviews

I will interview the advocates using questions below to see if anything has changed in each individual.

This is an outline, which will change as reflected in the design notes form.

Appendix C

Design Notes Form

(Adapted from Stephan, Cobb, & Gravemeijer, 2003)

Use specific examples to ground thinking about classroom practices.

Today's perceptions:

Social context:

Classroom activity/Mathematics practice (what are they doing):

Collective learning/Public discourse (perceptions, reasoning, argument, understanding):

Necessary supports for student learning (specify student):

Modifications necessary for execution of this lesson (and why):

Modifications in planning for next lesson (and why):

Students' expressed perceptions:

Students' demonstrated perceptions

Appendix D

Lesson Plans

Day 1: Developing Concepts

Time Frame: 2 hours

Standards Addressed:

9-12.G.1.5 Use definitions in making logical arguments.

Purpose: To develop conceptual understanding of finance and the underlying mathematical foundations. To develop group dynamics, increase mathematics communication, and develop concepts of lending, purchasing, and financial matters.

Accommodations/Modifications/Supports: Will discuss with advocacy center and implement after I have signed consent from participants.

Materials: Markers, magazines or newspaper, markers, interactive white board, pens pencils and a notebook for each participant.

Environment: The Metropolitan League of Self-Determined Individuals-large center room with many tables to accommodate 10 participants, grouped in pairs.

Introduction: We are going to talk about mathematics, ask why it might be important and why they decided to come to class. Go around the room asking about themselves, where they are from, where they went to school, what they learned in mathematics class, and their favorite part of mathematics class

Lesson Development: I will tell them that they are going to have partners for the duration of the money club.

We will:

- Talk about what they know about money
- What they may have purchased in the past
- Loans (borrowed from a friend or family), finance, ways of saving in role-play activity (I give an example, then have groups develop role-play for the larger group)
- Write about what they hope to get out of mathematics club. Draw pictures or communicate in other ways.

Take a 15-minute break for snacks

- Role play what lending, borrowing, spending and saving are. Use concrete objects and pass around like they are lending and borrowing.

Assessment: Completion of poster board, check for group participation, take notes on how all the groups and individuals are doing, look for ways to support individuals.

Day 2: Developing Concepts of Consumer Spending and Learning to Subtract

Time Frame: 2 hours (3-5 pm Thursday June 17th)

Standards Addressed:

9-12.A.1.3 Determine the relative position on the number line and the relative magnitude of integers, decimals, rationals, irrationals, and numbers in scientific notation.

9-12.A.1.4 Explain that the distance between two numbers on the number line is the absolute value of their difference.

9-12.A.1.5 Use a variety of computational methods, recognize when an estimate or approximation is more appropriate than an exact answer, and understand the limits on precision of approximations

Purpose: To develop conceptual understanding of consumerism and make good financial choices. To develop group dynamics, increase mathematics communication, and develop concepts of lending, purchasing, and financial matters.

Accommodations/Modifications/Supports: Gary and Mindy need concrete supports to understand numbers -

Materials: Markers, markers, interactive white board, pens pencils and a notebook for each participant.

Environment: The Metropolitan League of Self-Determined Individuals-large center room with many tables to accommodate 15 participants, 4 groups.

Introduction (10 lecture): Recap what we did last class. Talk about what concerns most of the advocates had (budgeting and keeping spending under control). What do you buy the

most at the store? What dishes do you make the most at home? What goes through your head when you choose to buy something? Price, product, color, etc.

- Card counting subtraction

Lesson Development: Sitting in groups. We will do the activities listed below:

1. **Menu Mathematics (20 group)** – what do you buy the most in a store (5): find Price per pound, ounce, liter, gallon, item
Using computer laptop and write down your prices in a shared notebook, (understanding bigger, smaller, and what is the best price). Focus on distance between numbers.
2. **Being Cheap (20 lecture)** - Calculator and manipulative work with fractions – what does it mean when something is 5, 10, 15, 20, 25% off. Saving money in one area can give you extra money somewhere else.
 - a. Shopping at retail store vs. Marshalls and TJ Maxx
 - b. Compare to shopping at Savers, Salvation Army, or Goodwill
 - i. What to look for in clothes and objects (stains, buttons, rips)
 - c. Shopping online – free shipping, no tax, no fees, look at reviews
 - d. Use magnitude to show the distance between items and what you can do with the savings. Use approximations
3. **Best Buys (20 group)** – Find the best prices on the internet for 5 items (rounding numbers to the nearest dollar)
4. **Snack Break (15)** – Eat and socialize

5. **Deal or no Deal (15)** – Teamwork. Guess how much our snacks cost and find how much I saved if I bought them on sale
- Buying items in season = sale
 - Buying out of season = hard to get, hard to ship, = cost skyrockets
 - How far away from the right answer were you – list in descending order closest to target to furthest from target.
6. **Cool Down (10)** – Homework – I will have to make a sheet to give them to support getting their homework complete.
- Find out how much you earn a week or a month?
 - Find out how much you pay for rent, food, transportation, or other fixed fees
 - Write down or bring in a grocery receipt that shows what you buy in a week to eat.
 - Write down how often you eat out each week?

Assessment:

- Student understands how to subtract
- Understands the magnitude of numbers and that the distance between numbers is the absolute value
- Can estimate using rounding
- Student knows how to conduct research using technology
- Student is communicating their knowledge with others
- Student is able to use calculator and find quick answers

Day 3: Discovery Learning with Supports

Time Frame: 2 hours

Standards Addressed:

9-12.A.1.18 Use the four basic operations (+, -, \times , \div) with linear, polynomial, and rational expressions in contextual situations.

9-12.A.1.8 Solve formulas for specified variables.

9-12.A.2.4 Construct a linear function that represents a given graph.

Purpose: To understand and apply knowledge of Multiplication as applied to concept of saving and accumulating savings through smart purchasing.

Accommodations/Modifications/Supports: Alejandro, Rex, Robert, Helen, Antonio, and Gary need concrete direct instruction with manipulatives to understand the concepts. Gary also needs a lot of processing and redirection back to the group. Mindy and Amy need Bridging (taking their prior knowledge and connecting it to our learning) and the best way to bridge with them is through argument. Lance, Patrick, and Pao may need more challenging curriculum, although multiplication may be their present ceiling. Watch how much time I spend with Lynne, Mindy, Patrick, and Amy in one to one situations. Get the help they need then walk away to encourage independence, they are more capable than they believe they are.

Materials: Diamond board with wire X,Y graph, Dry erase markers, mini dry erase boards, colored blocks, playing cards, receipts from buying snack, snack, tape recorders (4), measuring cups (2) and drinks.

Environment: The Metropolitan League of Self-Determined Individuals-large center room with four tables to accommodate 16 participants, four per group. **Mix up drinks before class and put in refrigerator.**

Introduction: Recapping last week: adding and subtracting 2 to 4 numbers simultaneously, Price is right, research on the internet. Tell them that I am proud of their efforts and to keep it up. Talk about the concept of struggling and working through it.

Ask: When do you feel the most happy?

When do you feel the most proud of yourself?

Lesson Development:

- (1) Card Counting Multiples:** Using Casino cards to learn about multiples and multiplying. Groups of 4.
- (2) The Art of Being Cheap:** Take multiple concepts further and show how everyday cheapness over time on one daily purchase can save a lot of money over a few weeks. Use Diamond board and graph one linear equation of savings. (Coffee) – 2.25 Starbucks (16oz) vs. \$10.00 lb makes 22.5 16oz cups. Savings of at least \$30.
- (3) Snack:** Quaker Chewy Bars and mixes of Ice Tea and Lemonade
- (4) Measuring Irregular Objects:** Ask class again where they think the $\frac{1}{2}$ -way point is and why they think the way they do.
- (5) The Price is Right: Paying for Convenience** – Using X, Y coordinates we will graph 3 different linear equations – one for the real cheap price on Toothpaste: Costco_____ vs. Smiths_____ vs. Walgreens_____ vs. 7-eleven_____.

Talk about that buying in bulk means you pay a lot up front and the savings follows you all year. Talk about some things **not to buy in bulk** – some spices, candy and ice cream (go to Wal-mart), brown rice (6 month shelf life), Toilet Paper and Paper towels (If you have limited space), Nuts (1-2 months), mayo, ketchup, salad dressing (unless you consume a lot), Bleach (loses 20% effectiveness per year). <http://finance.yahoo.com/family-home/article/109193/best-stuff-not-to-buy-in-bulk> (not to buy in bulk), and <http://www.mainstreet.com/slideshow/smart-spending/bargains/deals/save-money-buy-bulk> (what to buy in bulk). **Buy in Bulk:** - Cheerios .13 vs. .36 (\$11); Starbucks coffee .48 vs. .62 (\$5.21); cheese .13 vs. .36 (\$18); Laundry Detergent .08 vs. .18 (\$16); paper towels 1.39 vs. 3.35 (\$23); trash bags .05 vs. .22 (\$33); batteries .38 vs. 1.10 (\$25). Also see toothbrushes, blank CD's and DVD's, light bulbs, toothpaste, and all generic items (Advil vs. Walgreens brand)

Day 4: Discovery Learning with Supports

Time Frame: 2 hours

Standards Addressed:

9-12.A.2.6 Graph a linear equation and demonstrate that it has a constant rate of change.

9-12.A.2.14 Understand the relationship between the coefficients of a linear equation and the slope and x- and y- intercepts of its graphs.

9-12.A.3.1 Model real-world phenomena using linear equations and linear inequalities interpret resulting solutions, and use estimation to detect errors.

Purpose: To understand how to save money by applying the principles of supply and demand on produce and clothing purchases.

Accommodations/Modifications/Supports: Alejandro, Rex, Robert, Antonio, and Gary need concrete direct instruction with manipulatives to understand the concepts. Gary also needs a lot of processing and redirection back to the group. Mindy and Amy need Bridging (taking their prior knowledge and connecting it to our learning) and the best way to bridge with them is through argument. Lance, Patrick, and Pao may need more challenging curriculum, although Division may be their present ceiling. Helen has proven to be a great peer tutor – I may need to get her back in Antonio and Gary’s group, where she was supportive of their learning.

Materials: Diamond Shaped White Board with X, Y coordinates, Function table, small individual white boards, Dry-erase markers, snack from Sunflower market blocks and tiles,

Environment: The Metropolitan League of Self-Determined Individuals-large center room with many tables to accommodate 16 participants split amongst four tables.

Introduction: Recap of Tuesday's class on buying in bulk with disclaimer: What not to buy in bulk and staying in control of your spending when in a price warehouse. Talk about the four activities we will be doing in the next 2 hours: Card counting with division, Chopping up wholes into parts, supply and demand, applying supply and demand to buying produce and basic clothing purchases.

Lesson Development:

Card Counting – Use of multiplication/division triangle, pushing the whole and components concepts also including the composition/decomposition concepts

Chopping up wholes into parts – Guessing how to break up the piece of paper into $\frac{1}{2}$'s, $\frac{1}{4}$'s, $\frac{1}{8}$'s, and $\frac{1}{16}$'s. Once they get to the $\frac{1}{4}$ make connection to the coordinate plane, stand and make horizontal and vertical movements with hands.

Snack – Talk about the price of snack, where I bought it and why I am choosing that store to purchase the snack.

Supply and Demand – When there is a lot of something the price goes down due to competition and availability. People do not worry about whether there will be more of that object. When there is a scarcity or perceived scarcity or a brand new item that no one has ever bought, people worry that there will not be enough, so the value of that object goes up. **Law of diminished returns** – for each time you buy an item the intrinsic value for that item or the return on the price goes down. (ex. hot dogs, pizza)

Buying produce - Sale of the week – It always changes and can give your body different nutrients each week and offer variety to your diet.

Buying Clothes – Buy right after big holidays especially Christmas – Use the gift cards the week after Christmas into new years. You get the same clothes at 50% or more off the list price because their supply is up and they need to get rid of it. **Goodwill, Savers, Salvation Army** – Rich people give away well taken care of clothing that is very fashionable. Businesses, when they cannot sell an item will donate it for a tax credit, brand new and never used. Other impulse buyers after taking the item home wear it once and then do not want it anymore. **Keys to a good second hand purchase** - Make sure you look over the entire item, looking for rips, missing buttons, stains (especially under the arms), and discoloration.

- Discuss ways to organize our research and data using function tables
- Demonstrate examples of how to create and use tables
- Go through simulation of process: what are you taking a loan out for and why, plug in loan and interest and variable, take data and put in table, go to next loan, how to set up graphs.
- Guided practice with advocates
- Print out sheets and explain the tables and graphs to the group

Assessment:

- Students understand that buying in season for produce saves over 50%
- Students understand that buying used or on sale items saves 50%
- Student understands what X and Y mean and how to set up a graph in the future with any two or more variables

- Students understand the concept of part/whole; composition/decomposition of numbers.

**Day 5: Parts of a Whole: Learning about Credit Cards Through
Fractions, Decimals, and Percents**

Time Frame: 2 hours

Standards Addressed:

9-12.A.2.15 Evaluate estimated rate of change in a contextual situations.

9-12.A.1.1 Use the special symbols of mathematics correctly and precisely.

Purpose: To understand fractions, decimals and percents and apply this to understanding credit and charges that may apply.

Accommodations/Modifications/Supports: Alejandro, Rex, Brian, Antonio, and Gary need concrete direct instruction with manipulatives to understand the concepts. Gary also needs a lot of processing and redirection back to the group. Mindy and Amy need Bridging (taking their prior knowledge and connecting it to our learning) and the best way to bridge with them is through argument. Helen has proven to be a great peer tutor – I may need to get her back in Antonio and Gary’s group, where she was supportive of their learning. Rex and Antonio should be in separate groups.

Materials: Diamond shaped white board, dry erase markers, newspaper crumpled up into balls, buckets for making free throws, small white boards for charting their progress, calculators, paper, rulers, markers, pens, and pencils. four computers to look up loan percentages and fees

Environment: The Metropolitan League of Self-Determined Individuals-large center room with many tables to accommodate 16 people in groups of four.

Introduction:

- Talk about patterns in nature, objects, and apply it to numbers and money
- Your height is normally a one to one ratio to your wing span
- Your foot size is approximately 15% of your height

Lesson Development:

Fractions, Decimals, and Percents: Free Throws: Teams of four, chart their progress in increments of 4, 6, 8, and 10. Come back into group and we will chart the different percentages for each person. Then step back a few feet and see how your percentage goes increases or decreases. Predict with class before doing activity

Chopping up Wholes (equivalent fractions): $\frac{1}{2}$'s and $\frac{1}{4}$'s - Use paper and make up 12 boxes and color $\frac{1}{2}$ s and $\frac{1}{4}$ s

Law of Diminishing Returns: Have a bunch of cupcakes up on the table and talk about how the value of the cupcakes goes down after each cupcake you eat. 1st = awesome and delicious; 2nd = good and tasty (I must chase this sugar high and have another one, maybe I will enjoy that one as much as the first); 3rd = OK (I 'll try one more and if that is not good I will give up); 4th = I am feeling sick; 5th = I am sick and will pay you to get them out of my face

- Use example of hot dog eating contest On Coney Island every 4th of July (put on interactive white board)

Paying for spending beyond our means: Credit Cards vs. Debit Cards/Checks and Cash.

- Chart the difference after a number of months using credit and debit

- Find different charges for credit cards (intro APR for 6 months then automatically balloons to 12.99 for everyday APR) variable rate can go up at any time.
- Use per year at 12 and say it is 1% per month, with 50 late charges
- Talk about why certain businesses do not accept American Express and Discover cards
- Take the understanding of patterns and talk directly about money and paying the minimum
- Group discussion and brainstorm ideas on whiteboard
- Continue to develop meaning of function table, X,Y axis
- Give groups money loaned, interest, and time – look to see how they set up and complete a function table (X Years, Y Money)
- Present their table and have them discuss what it means and what patterns of money emerge
- After everyone presents group discussion on which rates and years patterns are the best for them as a consumer

Assessment:

- Can student understand patterns
- Can student understand quarters and halves
- Can student apply mathematics skills to function table
- Can student explain mathematics understanding of fractions, wholes, percents, and decimals

Day 6: Credit Card Algebra and Understanding Fractions

Time Frame: 2 hours

Standards Addressed:

9-12.A.2.15 Evaluate estimated rate of change in a contextual situations.

9-12.A.1.8 Solve formulas for specified variables.

Purpose: To take skills and understandings in organizing and evaluating change and using patterns in algebra to predict future costs in using credit cards and debit cards.

Accommodations/Modifications/Supports: Need to process expectations with class after last class. Need to establish a set of rules that is acceptable to the members of the money club. I will need to offer more concrete support for all learners when we do basic algebra for understanding credit card charges and fees.

Materials: Graph paper, pens, pencil, marker, Playing cards, diamond shaped dry erase board, small dry erase boards, dry erase markers, large ruler

Environment: The Metropolitan League of Self-Determined Individuals-large center room with many tables to accommodate up to 16 participants, groups of 4 each.

Introduction (25 minutes): Discussion- Whole group – questions: (1) How did last class go for you? – write down what they say. (2) What was the best part? – write down what they say. (3) What is a burning issue you have that can improve the money club going forward? - write down what they say. Ask them what main issue we should be working on as a group.

Rule Development – From what we just wrote down, what are some ground rules that are both fair and acceptable to all of us that will make our mathematics club a better place. Write it down and make copies

Lesson Development:

Card counting – $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$'s of numbers (20 minutes): deal cards and divide them by 2, 3, and 4, to find what $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ means for each number. Divide by three means “I want $\frac{1}{3}$ of this number.” Groups can increase difficulty by dealing more than one card, multiplying the numbers together and finding halves, thirds, and halves.

Credit Card Algebra:

Exploration (20 minutes):

Look up sites to find information on credit cards here is one example.

http://www.helpwithmybank.gov/faqs/credit_fees.html

an article on credit card fees is here (read to class):

http://www.usatoday.com/money/perfi/credit/2009-08-05-credit-cards-new-fees_N.htm 1. Each group will go to one credit card company's website and find all the fees that the company charges. (Capital One, Citibank, Wells Fargo, AMEX, Discover, MasterCard).

1. Go to “fees at a glance”

Then look up “important disclosures”

2. Write down the information for these terms: Cash Advance, Late Payment, Over Credit limit fee, returned payment fee, Annual Fee, Annual Percentage Rate (APR) - introductory and non introductory; fixed and variable, and Penalty APR.

3. Come back to the main group.

Snack (15 minutes): Price is right – Participants conjecture on the price of our snack with a tip on where to buy the item.

Large or small Group Number Crunching (applied Algebra) (30 minutes):

(1. Start as guided practice. Then either - break into small groups if I see that a leader or peer model can take over the group or continue with large group and have volunteers work out the problems)

1. Find yearly APR and apply it to 100, 1,000, 10,000 charge.
2. Find daily percentage rate and apply it to a 100, 1,000, 10,000 charge
3. Plug in various charges for each of the cards.
4. Plug in different variable APR's, including penalty APR.
5. Set up a formula with a missing variable to find basic interest charges for each month and how they compound over time.

Cool down and clean-up room (10 minutes) – Ask question: What was the most interesting thing you learned today? What was the most fun thing you learned today? How did our groups work today? What can we do next time to make class even better? Then clean room.

Assessment:

- Can student apply $\frac{1}{2}$'s, $\frac{1}{3}$'s, and $\frac{1}{4}$'s to numbers and understand fractions
- Can student organize data from credit card site on a function table.
- Can student evaluate change from function table from credit card site.
- Can student express their learning in a meaningful way.
- Can student evaluate their own work and the work of their peers in a way that can cause positive change for all members of the 'Money Club.'

Day 7: Smart Saving and Patterns in Algebra

Time Frame: 2 hours

Standards Addressed:

9-12.A.2.1 Evaluate estimated rate of change in a contextual situations.

9-12.A.3.1 Model real-world phenomena using linear equations and linear inequalities interpret resulting solutions, and use estimation to detect errors.

Purpose:

- To understand the value of saving for a big ticket item instead of using lines of credit.
- To use basic algebra to solve for amount of money needed to save over a set amount of weeks
- To estimate, guess, and conjecture about patterns in algebra

Accommodations/Modifications/Supports:

I need to explain what I am doing in a clear and concrete way, while keeping the tone of the class calm. Gary needs concrete support during the entire lesson. Antonio and Robert need guided practice and a lot of sideline coaching to get their heads in the right place to solve the problem.

The blocks helped during card counting, especially for Gary who could, after looking at a stack of blocks, find the midpoint and chop it in half. I had to give him clues to finding middle and string him along with ZPD type supports. Praise and constant attention to their solving of problems helped them continue to work on problems. I would ask follow up questions after they found one answer, so each person in the card counting exercise would

have to solve up to four problems for each number ($1/2$, $1/4$, $1/3$ and a follow up question on why).

I need to “slow down to speed up”, in other words I need to drive the concept longer and give solid examples for the group so they get a firm hold of the mathematics. Once they are clear in what we are doing, the learning will speed up and become firmly implanted in their minds. I will continue to calmly begin the class and take a lot of time in the beginning about what we are doing, how to do it and do a lot of guided practice. They absolutely are capable of learning what I want them to learn and have a lot of history or prior knowledge to tap into.

Materials: Paper (to cut into 4 strips), Scissors, Dry erase small boards, Dry Erase Markers, Diamond shaped board, snack, SMART board, and projector.

Environment: The Metropolitan League of Self-Determined Individuals-large center room with many tables to accommodate 16 participants in groups of 4.

Introduction: Talking about Credit Cards –(20 minutes, which includes late arrival of members) - Review last Thursday’s Credit Card lesson. What do you remember about Credit Cards? What are some differences between Credit and Debit? What are some issues with credit cards?

Lesson Development:

Warm-up (guided Practice - 20 minutes): Saving for the future and smart saving. I want to buy an IPOD TOUCH 16G – \$250.00 – find out how many weeks it will take at 10, 20, 25, and 50 per week savings. Graph for X as a group. Talk about how an IPOD Classic goes for

\$225 with 160G (10 times the memory) because it has an old design. The longer you save for an item of technology the more likely it will drop in price (go back to supply and demand)

Small Group work (20 minutes)– Finding way to meet your purchase goals: In large group using the SMART board find price of an item they want to save for and then break up into groups to find the amount of weeks needed to save for the item

Snack/The Price is Right (15 minutes): Guessing at the price of our snack item. Finding future price for set amount of pounds and compare to junk food

Patterns in Algebra (30 minutes): Cutting a folded piece of paper one and two times. Making conjectures about how many pieces will be left over after the paper is folded 1, 2, 3, 4 times. Guided practice and then explore. Use function table to organize data.

1 cut: 3, 5, 9, 17

2 cuts: 5, 9, 17, 33

Assessment:

- **What is the relationship between the number of folds and the number of cuts with the final amount of paper cut up?**
- **What is the value of a variable in a mathematics problem**
- **What is the X**
- **Can students understand the differences between credit and debit**

**Day 8: Bank Loans, Costs, Rates: Using Function Tables to
Graph Linear Equations**

Time Frame: 2 hours

Standards Addressed:

9-12.A.1.8 Solve formulas for specified variables.

9-12.A.2.6 Graph a linear equation and demonstrate that it has a constant rate of change.

Purpose: To research bank loans, understand variables and their functions, and be able to create and graph linear equations

Accommodations/Modifications/Supports:

I will need to do extensive guided practice and take the time to develop concepts through connecting what they know with the algebraic skills I am teaching. Gary will need peer support to stay in the classroom. Antonio will need peer support from Helen or Wes to have full participation in class activities. I will need to monitor and encourage Amy and Mindy to continue to work when they are frustrated. I will need to as concretely as possible explain and model what we are doing.

Materials: SMART board, projector, diamond board, small dry erase boards, dry erase markers and erasers, drinks pre-mixed, lap-top, internet access, paper, scissors.

Environment: The Metropolitan League of Self-Determined Individuals-large center room with many tables to accommodate up to 16 participants, in groups of four.

Introduction: Mindy goes to Hawaii: Review last classes main points including saving for a big ticket item (Mindy's \$832 ticket to Hawaii) and find out how long it will take Mindy to

save for the item at 20, 30, 50 per week. Add in food, hotel, and transportation. Think of snacks that do not go bad that she can take with her.

Lesson Development:

Loan search: guided practice – looking up a rate for a 1,000 loan: Talk about never going to a pawnshop, pay day loans, or any cash store (think of Phil Rizutto for the money store, in my youth).

- Apply the rate over the life of the loan, include closing costs and other costs
- Graph the life of the loan
- Talk about when to get a loan for something (Home or car).
- Talk about the difference between variable and fixed loan rates

Snack and the Price is Right: bring in snack from Sunflower that is on sale and guess on how much it will cost.

Loan Search, function tables, and linear equations (small groups with peer supports):

set up three computers to search for a 10,000 loan at three separate banks

- find the interest rate (know if it is fixed or variable) and all other costs
- set up equation and find out how much it will cost you for how many years you will be having the loan
- adjust the level of complexity if needed

Assessment:

- Student can understand what a variable is
- Student can know the difference between a fixed and variable rate of loan
- Student can graph an equation on board

-Student knows that as time goes on the loans interest increases

-Student can work collaboratively in groups

Day 9: Saving, Investing, and Scams

Time Frame: 2 hours

Standards Addressed:

9-12.A.1.8 Solve formulas for specified variables.

9-12.A.1.17 Solve linear equations and inequalities in one variable including those involving the absolute value of a linear function.

Purpose: To understand and apply univariate linear equations to banking rates and saving money.

Accommodations/Modifications/Supports:

I will need to regroup and refocus the 'Money Club'. It is the downward slope of the class (75% complete) and I will have to continue to keep pace in class and end strong.

I will need to do extensive guided practice and take the time to develop concepts through connecting what they know with the algebraic skills I am teaching. Gary will need peer support to stay in the classroom. Antonio will need peer support from Helen or Wes to have full participation in class activities. I will need to monitor and encourage Amy and Mindy to continue to work when they are frustrated. I will need to as concretely as possible explain and model what we are doing.

In order to do well I will need to be cognizant of frustration levels within the group. I need to also monitor the talking within groups, the concepts will be challenging to learn and if I lose them for a few minutes it will impact their understanding and frustrations will go through the roof.

Materials: Diamond shaped white board, Dry erase markers, small dry erase boards, meter stick (to show interest rates), tape recorders, load all of them and remember to reload at $\frac{1}{2}$ hour intervals. Paint stirrers from home depot. SMARTT boards.

Environment: The Metropolitan League of Self-Determined Individuals-large center room with many tables to accommodate up to 16 participants, in groups of four.

Introduction:

Team meeting: Recap what we have accomplished thus far. Talk about how we have three classes left and we need to lock in and do our best. Talk about how we are going into Algebra and everyone will need to help each other out.

Lesson Development:

Warm – up large groups 1 step algebra: talk about the word algebra (al-jabr – bone setter or restoration). How we have missing pieces and need to complete a puzzle. Use concrete examples of water and a 32oz pitcher pour some into a glass and ask them how much is in the glass. Then go into the meter stick and break it. Ask them to find the measure of the piece broken and hidden if they had the original length and one of the pieces.

Small Groups 1 step algebra: repeat exercise with the small groups, monitor for levels of frustration.

Savings rates large groups: Use SMARTT board - take the 1 step algebra that the people were doing and apply it to 1 step savings rates over a span of a year. (Use ING direct as an example and go over their finer points of savings and fees). Also look into CD's and their rates over variable months. Look at fees. Let them know that the rates are the worst I have seen in years at 1.10%, ING is normally around 5%.

Snack/the price is right: Conjecture and apply the guesses to how much snack costs.

Formula for savings: Apply the savings rates to the standard formula for one year. Take turns coming up to the board to find out the answer.

Assessment:

- Student can understand the basic concepts for algebra.
- Student can take univariate data and plug into linear equation.
- Student can understand what interest is and find the amount earned in a set amount of time.

Day 10: Savings, Investing and 2-Step Algebra Problems

Time Frame: 2 hours

Standards Addressed:

9-12.A.3.4 Solve systems of linear equations in two variables algebraically and graphically.

9-12.D.2.9 Use linear patterns in data to make predictions.

Purpose:

-To have a clear understanding of the concepts of one and two step Algebra and its applications to real life situations involving money.

-To solve these problems with peers

Accommodations/Modifications/Supports:

I will need to do extensive guided practice and take the time to develop concepts through connecting what they know with the algebraic skills I am teaching. Gary will need peer support to stay in the classroom. Antonio will need peer support from Helen or Wes to have full participation in class activities. I will need to monitor and encourage Kathryn and Mindy to continue to work when they are frustrated. I will need to as concretely as possible explain and model what we are doing.

In order to do well I will need to be cognizant of frustration levels within the group. I need to also monitor the talking within groups, the concepts will be challenging to learn and if I lose them for a few minutes, it will impact their understanding and frustrations will go through the roof.

Materials: Diamond shaped white board, Dry erase markers, small dry erase boards, meter stick (to show interest rates), tape recorders, load all of them and remember to reload at $\frac{1}{2}$

hour intervals. Paint stirrers from home depot. SMARTT board, five lengths of rope for tying.

Environment: The Metropolitan League of Self-Determined Individuals-large center room with many tables to accommodate up to 16 participants, in groups of four.

Introduction: Talk to the group while I encourage them to do their best for the next three classes. Ask: What do you remember about what we did in class on Tuesday? How did you feel about doing algebra? Do you believe that working on things that are frustrating is a good or a bad thing?

Lesson Development:

Paint Stirrer and the concept of Restoration (30minutes): Demonstrate that by breaking up the stirrer you can still restore it. Then have groups of two or three break the five remaining stirrers. They will hold onto one piece and I will take one from each group. I will then pile them on a table and have them search for the missing piece after they measure the piece remaining. Repeat three times

Knot Tying and the concept of Order of Operations (45 minutes): Demonstrate tying two knots and show the forward and backward nature of tying knots. Explain that it is the same as order of operations. Have them tie and untie knots. Then apply it to the two-step algebra problems and work as a large group.

Snack (15 minutes) price is right (10 minutes): find the price of the daily snack.

Researching Mutual Funds (20 minutes): Apply two-step algebra to the fees and expected earnings of the average mutual fund over a span of years.

Assessment:

- Student can understand 1-step algebraic concepts
- Student can understand 2-step algebraic concepts
- Student can solve for 1-step algebraic concepts
- Student can solve for 2-step algebraic concepts
- Student can understand application to saving and investing

Day 11: Saving, Investing, and Scams

Time Frame: 2 hours

Standards Addressed:

9-12.A.1.8 Solve formulas for specified variables.

9-12.A.1.17 Solve linear equations and inequalities in one variable including those involving the absolute value of a linear function.

Purpose: To understand and apply univariate linear equations to understand and avoid scams.

Accommodations/Modifications/Supports:

I will need to do extensive guided practice and take the time to develop concepts through connecting what they know with the algebraic skills I am teaching. I will also have to make significant connections between the algebra and the scams. Gary needs peer support to stay in the classroom. Antonio needs peer support from Helen or Wes to have full participation in class activities. I will need to monitor and encourage Kathryn and Mindy to continue to work when they are frustrated. I will need to as concretely as possible explain and model what we are doing.

In order to do well I will need to be cognizant of frustration levels within the group. I need to also monitor the talking within groups, the concepts will be challenging to learn and if I lose them for a few minutes it will impact their understanding and frustrations will go through the roof.

Materials: Diamond shaped white board, Dry erase markers, small dry erase boards, tape recorders, load all of them and remember to reload at ½-hour intervals. SMARTT boards and loaded powerpoint on scams.

Environment:

The Metropolitan League of Self-Determined Individuals-large center room with many tables to accommodate up to 16 participants, in groups of four.

Introduction:

Team meeting: Recap what we did last week and explain the connections of two-step algebra to basic banking interest with fees and investing with fees.

Lesson Development:

Warm – up - Large groups 1 and 2 step algebra: talk about the word algebra (al-jabr – bonesetter or restoration). How we have missing pieces and need to complete a puzzle. Use concrete examples.

How to identify a scam: Ponzi scams – Role-play how this sleight of hand scam works and how to avoid it. Play a game around the ponzi scheme in taking 10 cubes from each person and paying them back one for each quarter of the year in dividends (at the end of the year he takes another 10 blocks and gives back 1 each quarter again – find out how much he gets back

Internet Scams: The ‘Nigerian letter’ – Asks for you to send the person your account number so they can wire money for you to hold for them in your account and you will get a percentage of the profits. Any email wanting to talk business that you do not know.

Telemarketer Fraud: Never buy from a person who calls you and you do not know who they are

Buying Online: Use only reputed online sellers. Ex: EBAY, Amazon, Overstock.com and all major sellers.

Scams in the community: Beware of Used car dealers, Pawn Shops, and Money stores, Payday loans, etc.

Snack/the price is right: Conjecture and apply the guesses to how much snack costs.

Two-step algebra revisited: How the Ponzi Scheme works: use same lesson as above and show algorithm for the scheme and how each year the scam generates more money for them and none for you.

- Practice algorithm.

Assessment:

- Student can understand the basic concepts for algebra.
- Student can take univariate data and plug into linear equation.
- Student can understand and spot scams
- Student can learn to avoid scams in the community as well as online

Day 12: Skill Showcase, Awards Presentation, and End of Money Club Party!

Time Frame: 1-1/2 hours: Due to Scheduling conflict

Standards Addressed:

9-12.A.1.8 Solve formulas for specified variables.

9-12.A.1.17 Solve linear equations and inequalities in one variable including those involving the absolute value of a linear function.

Purpose: To apply univariate linear equations to understand and avoid scams.

<http://www.abqjournal.com/biz/18213414biz07-18-10.htm>

Accommodations/Modifications/Supports:

I will need to do extensive guided practice and take the time to develop concepts through connecting what they know with the algebraic skills I am teaching. I will also have to make significant connections between the algebra and the scams. Gary needs peer support to stay in the classroom. Antonio needs peer support from Helen or Wes to have full participation in class activities. I will need to monitor and encourage Kathryn and Mindy to continue to work when they are frustrated. I will need to as concretely as possible explain and model what we are doing.

In order to do well I will need to be cognizant of frustration levels within the group. I need to also monitor the talking within groups, the concepts will be challenging to learn and if I lose them for a few minutes it will impact their understanding and frustrations will go through the roof.

Materials: Diamond shaped white board, Dry erase markers, small dry erase boards, tape recorders, load all of them and remember to reload at ½-hour intervals. SMARTT boards and loaded PowerPoint on scams.

Environment:

The Metropolitan League of Self-Determined Individuals-large center room with many tables to accommodate up to 16 participants, in groups of four.

Introduction:

Team meeting: Recap what we did last week and explain the connections of two-step algebra to basic banking interest with fees and investing with fees. Introduce the visitors to the group: Ruth Luckasson, Kelley Peters.

Lesson Development:

Warm – up – Ask the advocates about their favorite part of mathematics club?

What part was the hardest part? What part was the part that they were most proud of? Then ask volunteers to solve problems on the board or in small groups with the cards. Also ask them to talk about the scams they will avoid and why?

Pizza party and awards show: Pizza to be delivered at 3:30, pass out awards talk about each student and what they did in the club. Eat and enjoy the last class of the study!

Assessment:

- Student can understand the basic concepts for algebra.
- Student can take univariate data and plug into linear equation.
- Student can tell the group both what they learned and struggled with.

Appendix E

Final Draft Coding Sheet and Coding Definitions

(12/20/2010)

Class Date:		Class Number:			Lesson Theme:		
Name	Problem Solving	Experience	Lesson	Engagement	Money Habits	Perceptions	Disposition
Lynne							
Helen							
Amy							
Mindy							
Wes							
Antonio							
Robert							
Gary							
Patrick							
Alejandro							
Me (Anthony)							

Problem Solving

I = Invented Strategy – person invented or manipulated a modeled strategy for solving problems.

PM = Peer Model – acted as a mentor or model student for other member

S = Support – used (t) teacher or (p) peer to solve problem

MM = Mathematics Model – used mathematics model to solve problem.

G = gave up - stopped working, showed verbally or non verbally that they have stopped working on a problem.

Al = Alone – worked on a problem alone, separated from group.

Experience

Sc = Scams – (v) victim of a scam or (p) perpetrator of a scam

Ab = Abuse – (ph) physical or (e) emotional, (s) to self (o) by others

P = Past affecting present experience (citing past, remembering the past in a way that influences present class issue or thinking) (+) positive, (-),

E = Education – (h) high school, (m) middle school, or (e) elementary

Lesson

Ma = Mathematics – (c) concepts, (s) skills, (md) models

Mo = Money – (c) concepts, (s) skills, (md) models

Engagement

F = Frustrated – verbal (words, noises) or nonverbal (stops discussing with group, drops pencil, walk – out).

D = Detached – off task, fooling around, talking (not about money or mathematics), bored look.

Pa = Passive – low affect, looking for others to solve problems, not answering group questions, others doing most of the group work, nodding head, looking away from teacher.

Ac = Active – expressive features, engaging group, answering questions, working the models, thinking aloud, arguing.

(l) large group or (s) small group or (1) one to one direct instruction

Money Habits

IB = Impulse Buyer – buying on a whim, without thought of long term consequences

- (co) **Collector** – purchasing items that are permanent (tv's, cd's, cars, non- perishable items) or
- (sp) **Spender** – purchasing things that are perishable (food, drinks, good times).

G = Gambler – spending money thinking they will make it back (ca) casino, (l) lottery, or (p) ponzi styled scam.

SS = Smart Shopper – looks for deals, uses coupons, looks for best price, thinks ahead and shops around. Does not walk into one store and purchase based on whim.

W = Wait and Save – saves their money over time to purchase an item without using credit, spends within their means(mainly IB but in rare occasions can be SS).

SP = Spend and Pay – spend first pay later, will pay for items over time and incur charges (can be IB or SS).

Sq = Saver (The Squirrel) – loves to save all their money for a rainy day, possibly to a fault

Perceptions

Se = Self

O = Others

Ma = Mathematics

Mo = Money

Disposition (temperament, tendency, mood, inclination, or manner of participant)

Ad = Advocate

V = Victim

Sd = Self-Determined

Pa = Passive

Po = Positive

Ne = Negative

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