

Peer Mediation as a Strategy to  
Teach Individuals with Dyscalculia

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According to 2003 statistics from the U.S. Department of Education, individuals with specific learning disabilities comprise the largest percentage of students under age 21 served by the Individuals with Disabilities Education Improvement Act (IDEA). Within the learning disabilities category, dyslexia, or reading impairment, receives a noticeable amount of attention in the media. This is no surprise, as most people would list reading competency as must-have modern survival skill. Conversely, dyscalculia or math learning disability has skirted the popular media spotlight, despite the fact that it affects an estimated six percent of children between the ages of 6 and 14 (Fleischner & Manheimer, 1997).

Perhaps the lack of attention to dyscalculia among the general public can be attributed to a theory proposed by mathematics professor Mahesh Sharma. In 1989, he asserted that math failure simply is not a stigma in the United States (as cited in Newman, 1998). Unlike reading disability, being “bad at math” is considered a socially acceptable excuse for failure. Lacking public attention or the societal pressure to recognize dyscalculia as a lifelong disability, students who struggle with it may incorrectly assume that it is merely a temporary nuisance to deal with until high school graduation. But in a capitalistic society, that notion is far from true. Math ability is as essential to modern survival as reading, spelling, or writing, and providing learning strategies for individuals with inadequate math competency is essential. Higher education researchers Beacham and Trott (2005) have asserted that the poor

fundamental math skills associated with dyscalculia often translate into difficulty with money management, which may severely limit an individual's livelihood as an adult.

Math ability isn't a skill requirement only for college math majors. Rather, every individual must possess some level of math mastery to function independently in modern society. It is vital that educators prepare all students with a working knowledge of math and, by association, financial concepts. And that effort must include effective teaching strategies to help individuals with dyscalculia, which this research paper will define and explore. Specifically, it will address research regarding peer mediation as a successful teaching strategy for individuals with math disability.

### **Defining and Diagnosing Dyscalculia**

An individual with dyscalculia or math disability experiences delays in the ability to count and calculate numbers (Torbeyns, Verschaffel, & Ghesquiere, 2004). Newman (1998) explains that some symptoms are quantitative (e.g., inability to memorize and recall math facts, rules, and formulas), while others are classified as qualitative (e.g., inability to understand how to complete step-by-step math operations, perhaps due to lack of comprehension of the specific language associated with math). Michaelson (2007) summarizes that some scientists have traced dyscalculia's cause to dysfunction in the brain's right hemisphere, which also controls spatial learning and social skills development. But researchers have proposed other causes, including heredity, poor environment, overall low intelligence, math anxiety, and poor social skills. And research by Fleischner and Manheimer (1997) takes a different approach, suggesting a causal connection between dyscalculia and poor teaching methods and materials. To further complicate the discussion of causes, Michaelson also points out

that more than 15% of individuals with dyscalculia also show symptoms of dyslexia, and more than a quarter have been diagnosed with attention deficit-hyperactivity disorder.

Teachers and special education professionals informally identify math disability through direct observation, interviews, and error analysis to understand why a student consistently solves math problems incorrectly (Fleischner & Manheimer, 1997). Others rely on formal assessment demonstrated by low scores on standardized achievement tests that measure computation, concepts, and applications. Michaelson (2007) also mentions the effectiveness of the Dyscalculia Screener as a diagnostic tool, but explains its use is not widespread due to expense.

Regardless of method, early diagnosis of dyscalculia is critical because, as with many core subjects, each concept in math builds cumulatively upon previous learning. Undiagnosed individuals may experience a swift downward spiral in performance when their own dyscalculia symptoms manifest themselves, whether that happens at the counting stage of instruction or when students begin more complex calculations. Repeated failures at math will likely damage a student's confidence, leading to the label, "bad at math." Whether self-imposed or externally bestowed, that label may cause a student to avoid course correction.

While scientists continue to search for dyscalculia's cause, and researchers debate diagnosis methodology, educators in the classroom need proven intervention strategies to cope with the everyday reality of math learning disability. Fortunately, use of peer mediation has shown success.

### **Peer Mediation as a Teaching Strategy**

In elementary and middle school, students learn to experience the world beyond their families, especially through daily exposure to their classmates. In fact, their classroom peers may be their greatest influence. Through observation and daily interaction, classroom peers unintentionally influence, challenge, and teach each other. And when teachers intentionally guide the natural peer relationship by organizing tutoring, they may also witness success in math disability intervention.

A survey by Maccini and Gagnon (2006) revealed that 27% of general education teachers and 36% of special educators use some form of peer-mediated tutoring or instruction to teach math. The effects of this strategy are encouraging: An analysis of math intervention methods (Baker, Gersten, & Lee, 2002) concluded that six studies on peer-assisted instruction in math showed positive results in students' computation skills. Additionally, Kunsch, Jitendra, and Sood (2007) concluded that the general education classroom setting yielded more promising results than the segregated special education setting.

When conducted properly, peer-mediated instruction capitalizes on a primary provision of IDEA 2004. It actively engages all students in the least restrictive environment — the inclusive general education setting. And besides improving math ability, peer mediation's focus on interaction may offer additional benefits for students with math disability: the chance to improve social skills, learn the importance of cooperation, and be an active participant in learning (Fuchs, Fuchs, Mathes, & Martinez, 2002).

Yet another benefit of this strategy is one that affects students without disabilities. Friend (2008) suggests that peer-mediated instruction clearly illustrates to

the whole general education class the value and importance of every student, regardless of ability. That example may lead to greater acceptance of learning disabilities by the general public.

### **Implementing Peer Mediation in the Inclusive Classroom**

Peer-mediation as a strategy in the general education setting may take the following forms (Mastropieri, Scruggs, & Berkeley, 2007):

1. Peer assistance: Students helping individuals with disabilities read directions and gather materials.
2. Cooperative learning: Students collaborating in defined, small groups.
3. Classwide peer tutoring: Regular pairing of students who participate in one-on-one guided instruction, repeated practice, prompt feedback, and error correction (Friend, 2008; Harper & Maheady, 2007).

For the purposes of implementation, this study focuses specifically on classwide peer tutoring. A teacher implementing this strategy in an inclusive classroom should follow these steps:

#### **Reciprocal pairing of students with diverse math skills**

Before the actual tutoring sessions begin in the classroom, the teacher should give careful thought to the pairing or grouping approach. One might think the best strategy would be to pair students with the strongest math skills to those students with the weakest. However, middle school math teachers Kroeger and Kouche (2006) noted success using a slightly different pairing approach in their inclusive classroom. They ranked the 20 students in their class based on math assessment scores, then split the pool of students in half, creating two groups of ten. They paired the student with the

highest assessment (ranked as number one) with the student ranked as number eleven. Then they paired student number two with student number twelve, and so on. During tutoring sessions, the students switched roles as tutor and tutee in a reciprocal relationship. According to the teachers' results, these diverse pairings seemed to foster a more welcoming atmosphere for the students with math disability. A similar approach also may be considered when creating tutoring groups of three students.

### **Classroom introduction to the concept**

Because much modern learning is based on teacher-led instruction, Friend (2008) suggests the teacher should introduce the peer-led concept to students before implementing it. This introduction allows students to ask questions and the teacher to explain peer tutoring's role in the class's math instruction. Using age-appropriate language, the teacher should explain that peer tutoring will supplement rather than replace teacher-led instruction. The introduction is also a perfect time to explain that peer mediation requires cooperation and collaboration, not competition. The teacher can explain that a benefit of peer tutoring is the equal opportunity for every student to have one-on-one instruction time (Baker et al., 2002), and the chance to practice and hone math skills, without the pressure of the whole class watching and listening.

### **Obtaining appropriate instruction materials**

If the teacher is unable to find existing, age-appropriate math instruction materials to use in the peer-tutoring program, he or she may need to create original materials. This was the case for teachers Kroeger and Kouche (2006). Unable to find age-appropriate materials for their class, they created their own, which included math

problems to solve, student scripting for how the tutor should respond to correct and incorrect answers, and a scorecard on which the tutor tallied the tutee's answers.

### **Training through demonstration**

The teacher must clearly explain to the students the responsibilities associated with their peer mediation roles, and should train students how to use the tools. The best method for this training may be demonstration (Friend, 2008; Kroeger & Kouche, 2006). The teacher should model how a tutor should deliver scripted feedback and how to keep score. If the tutoring lesson involves a game, the teacher should demonstrate how to play, modeling each of the roles, and gradually involving students in the demonstration before encouraging guided practice. Within that demonstration, the teacher should be sure to show tutees appropriate behavior for accepting feedback from the tutors.

### **Practice and discussion**

After sufficient time is devoted to demonstration, the teacher should pair up students based on previously chosen pairing methodology and distribute the instructional materials to allow practice time with the peer-mediation approach. Circulating among the pairs, the teacher should observe and provide support and feedback to the students. After the practice session, the teacher should share those general observations with the whole class, and then ask the students to switch roles and practice again (Friend, 2008).

### **Regular use of the strategy**

At first, it may be wise to pre-schedule regular, frequent peer-tutoring sessions so that students become familiar with the strategy. Eventually, the teacher may want to



schedule the sessions based on the math concepts that require more practice or that cause students the most struggles. Kouche (2006) used this approach, treating the peer tutoring as a supplement to her teacher-led instruction.

### **Implications for Use of Peer-Mediated Instruction as a Dyscalculia Intervention**

Without intervention, children with dyscalculia may grow into adults who lack basic modern survival skills. Without the ability to understand and apply basic math concepts, they will likely have trouble with a range of adult financial responsibilities, from conducting simple money transactions to understanding the complicated terms of a loan contract. In fact, some victims of the current foreclosure crisis have admitted lack of complete understanding of their own signed mortgage agreements. And some adults filing for bankruptcy have cited similar stories about the confusing small print of credit card agreements. While researchers may not have documented a connection yet, it seems plausible that lack of math ability and undiagnosed dyscalculia may be a significant root of the current personal bankruptcy crisis occurring in the United States. Putting the successful technique of peer mediation into wider practice in the general education classroom could provide intervention, better prepare students, and perhaps help reverse the rising financial crisis trend.

When used consistently, research has shown that the tools and approach of peer-mediated instruction create a supportive, encouraging, and engaging learning environment within the general education setting, and have helped improve the computation skills of students with math disability. (Baker et al., 2002). The strategy's emphasis on collaboration, repeated practice, and instant feedback keep distracted

students engaged, and improve students' self-esteem about their capability to learn (Harper & Maheady, 2007). Wider use of the peer mediated tutoring strategy, coupled with deeper research on and public attention to the consequences of dyscalculia, could better equip the individuals with dyscalculia to handle our capitalistic world not as victims who are "bad at math," but as capable, confident, financially independent adults.

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