What is a mathematics disability?

NC Collaborative for Mathematics Learning

MATHEMATICS DISABILITIES

Many terms have been associated with Mathematics Disabilities (MD), most notably *dyscalculia, acalculias, mathematics learning disabilities, pseudo-dyscalculia, and mathematical difficulties* (Butterworth & Reigosa, 2007)*.* Not only are a variety of terms used, but there is the lack of a clear definition that is agreed upon by all educators. No matter the nature of the MD, these range of terms are used to describe children performing in the lowest 30% on standardized tests and *developmental dyscalculia* refers to those who score between 3.6% and 6.4%, a more severe impairment (Butterworth & Reigosa, 2007)*.*

Most researchers agree that MD are neurologically based disorders that impede the learning of mathematics; they are cognitive impairments in mathematical ability that do not stem from poor instruction or other factors (Mazzocco, 2007). In fact, Mazzacco distinguishes MD from *mathematics difficulties*, the latter referring to students who do poorly in mathematics because of poor instruction or other disorders like ADHD or mathematics anxiety (Shalev, 2007). Another unique caveat are students who have both MD and RD (reading disabilities). This combination causes unique issues when word problems are introduced or when more discourse is used that involves reading and writing as is noted in many state-revised standards.

WHAT ARE SYMPTOMS OF MATH DISABILITIES?

The NC State Standards and NCTM recommend that students have the opportunity to develop0 conceptual knowledge, procedural fluency, and problem solving abilities both with peers and on their own (NCTM, 2000). These goals can be difficult for students with MD and especially those with comorbid difficulties (RD and MD) since problem solving often requires reading and interpreting difficult mathematics texts (Bottge, Ma, Gassaway, Toland, Butler, & Cho, 2014). Depending on

the age range of the students, researchers have developed lists of a variety of indicators for MD. Most of the research into students' mathematics disabilities has centered on early number sense and computation with very little at the middle school level and beyond.

Many students with MD have extreme difficulty with fraction operations and concepts. Understanding fractions at a conceptual level is complex, even for those students without MD. Add to this the lower level of number sense that likely follows these students from earlier years, and the effect is an inability to understand and to use fractions efficiently. As Hecht, Vagi, and Torgesen (2007) discuss, learning fractions at a conceptual level means understanding the different nature of a rational number; that fractional units possess part-whole, measurement, ratio, quotient, and operator interpretations. Knowing how and when to interpret a

DISCUSS WITH YOUR COLLEAGUES

1. *Do I believe all students are capable of learning mathematics?*
2. *How do I know if my students have disabilities? How do I know if it is a mathematics disability as opposed to a more general one?*
3. *Take the time with your special education colleagues to learn how to read an IEP and 504 plan. What specific questions do you have?*
4. *Take a mathematics lesson and discuss how to differentiate for students with specific disabilities in your classroom this year.*
5. *For specific instructional strategies to use, see the Instructional Strategies for Students with Disabilities Research Brief.*

rational number in these distinctive ways often eludes the typically achieving student, not to mention those with MD. Having a conceptual understanding of fractional quantities is inherently linked to solving procedural problems with fractions (Hecht et al., 2007).

Proportional reasoning has been identified as another complicated mathematical area for students with MD, especially if issues at the elementary level have not been remediated (Hecht et al., 2007). Reasoning proportionally, and hence, algebraically poses unique challenges due to the abstract nature of the domain. Middle school mathematics is replete with algebraic and proportional situations and more research should be conducted in order to ascertain the specific nature of the struggles that MD students have in this area, not to mention the instructional support that is needed.

Another significant mathematical area that students with MD may have difficulty with throughout the grades is geometry and spatial relations (Butterworth & Reigosa, 2007). Being unable to maintain a spatial image mentally makes all learning strands incredibly elusive for these students.

HOW DO WE BEST SERVE STUDENTS WITH MATH DISABILITIES?

There are a multitude of best practices to support students with MD in their school experience.

Response to Intervention (RTI). RTI is a multi-tiered approach to identifying students with disabilities early and providing targeted academic support. Tier 1 is the first intervention and includes high quality mathematics instruction in the least restrictive environment. Qualified teachers and research- based teaching approaches/curricula should be employed at this level, with close monitoring and assessment of students at risk for MD. Students who are not making progress are then served with the second Tier Intervention which consists of more intensive, supplemental mathematics instruction typically in smaller group settings. Tier 3 interventions entails making a comprehensive evaluation using data from Tiers 1-3 to determine if the student is eligible for special education services. Once identified as having a disability, a 504 plan and/or IEP are constructed.

504 plan and IEP. Section 504 is a civil rights law that protects individuals with disabilities by stating that no qualified individual with a disability in the United States of America shall be excluded from, denied the benefits of, or be subjected to discrimination under any program or activity that receives Federal financial assistance or is conducted by an Executive agency or the United States

Postal Service." (34 C.F.R. §104.33. Section 504 of the Rehabilitation Act of 1973).

A 504 plan often is monitored by the guidance counselor or another professional in the school. These plans are typically more simplistic in nature than an IEP (Individual Education Program) and simply provide guidelines as to what a student might need, so that discrimination based upon a special need does not occur. An IEP is created in collaboration with the guidance counselor, parents, students, special educator, and other professionals and is a plan of support for students who have been identified with a mathematics disability. Accommodations that are typically suggested include reduced number of problems on homework, more time on homework and tests, and a calculator or other technological support. Other accommodations might include having a portion of a test read to the student, and graph paper or sketches of tables or figures.

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