

Specific Challenges for Students With Disabilities

Students with disabilities can have additional difficulties with mathematics, including algebra, because of learner characteristics that are the result of their disability. These characteristics can make the learning of important algebra concepts and skills difficult unless instruction is responsive to these characteristics. Experts in the field (e.g., Allsopp, Kyger, & Lovin, 2007; Berch & Mazzocco, 2007; Geary, 2011; Miller & Mercer, 1997) have described these characteristics and how they can impact mathematical learning for these students.

Our focus is on five disability-related characteristics in particular that affect mathematical learning. These characteristics include deficits related to memory, cognitive processing, attention deficits, metacognition, and reading. Table 2.1 summarizes each disability-related learner characteristic and how it can affect students' success with algebra-related concepts and skills. Teachers can benefit from this information by reflecting on how the examples might relate to the struggles they have seen their students experience with particular concepts and skills.

Table 2.1 *Disability-Related Learning Characteristics That Affect Learning Mathematics*

Characteristic	Description	Effect on math success
Memory deficits	Memory deficits are neurological in nature and affect students with disabilities in a variety of ways, including retaining new mathematical knowledge (memory storage), retrieving mathematical knowledge from memory accurately (memory retrieval), and making sense of mathematical information they are learning at the moment (working memory).	Memory deficits cause students to have difficulties retrieving math knowledge efficiently and accurately (e.g., recalling basic addition, subtraction, multiplication, and division facts as well as multistep sequencing and problem solving). Working memory problems can result in students having difficulty with memory retrieval, thus causing them to gain only partial understanding of newly presented mathematics and causing difficulties completing complex mathematical procedures.

Table 2.1 *Disability-Related Learning Characteristics That Affect Learning Mathematics (cont'd)*

Characteristic	Description	Effect on math success
Attention deficits	<p>Attention deficits are neurologically based difficulties characterized by distractibility/inattention and hyperactivity/impulsivity. Distractibility occurs because students are predisposed to “hyper-attend,” where their brains are attending to multiple stimuli going on as mathematics instruction is occurring or as they are engaged in doing mathematics during independent practice. Distractibility/inattention makes it difficult for students to focus on mathematics because they have difficulty filtering out the relevant from the irrelevant stimuli to which their brains are attending. Hyperactivity/impulsivity is when students engage in a behavior or respond to a math task in ways that appear to be without reason. For example, a student may get up from his chair and go to sharpen his pencil or get a book from the bookshelf during math instruction, or a student might respond to a set of equations that require multiplication by using addition. In either case, the student’s brain is responding to an internal or external stimulus compelling the student to engage in the behavior even though it is inconsistent with what one might expect.</p>	<p>Learning and doing mathematics requires a great deal of mental energy, attention to detail, and perseverance. Distractibility, hyperactivity, and impulsivity cause students to miss parts of instruction, which results in students not getting the full picture when new math content is taught or missing parts of directions being provided. Also, when doing math, students can be distracted easily, thus resulting in missing a step to an algorithm or problem-solving process or failing to attend to important information in a table or symbols in equations. Students may have difficulty in discriminating subtle differences between two or more math representations (e.g., recognizing expressions that reflect the commutative property).</p>

Table 2.1 *Disability-Related Learning Characteristics That Affect Learning Mathematics (cont'd)*

Characteristic	Description	Effect on math success
Metacognitive thinking deficits	Metacognition involves executive functioning skills that include activities such as planning and sequencing, self-monitoring, and goal setting. Students with metacognitive thinking deficits have greater difficulty compared to other students in monitoring their learning (e.g., evaluating whether they are learning, implementing strategies when needed, knowing whether a strategy is successful, and making changes when needed). These are essential skills for any problem-solving situation. Students with metacognitive thinking deficits can also have difficulties with independently connecting one mathematical idea or concept to another or to their real-world experiences.	Because problem solving is an integral part of mathematics, students who are not metacognitively adept will have difficulty being successful with mathematics that requires them to employ problem-solving strategies and to monitor their success. Students may also have greater difficulty naturally making connections among related math concepts and skills (e.g., the inverse relationship between multiplication and division).
Cognitive processing deficits	Students with cognitive processing deficits have difficulty accurately perceiving or interpreting what they see, hear, and/or feel due to a neurological difference. Although they do not have sight or hearing difficulties, their brains sometimes interpret what they see or hear differently. For example, a student with a visual-motor processing deficit may accurately see a mathematical representation that is presented, but as the brain processes the visual information and integrates the information with the motor system to write the mathematical representation, the information gets distorted, and the student writes the mathematical representation differently without noticing it. Students who have an auditory processing deficit may have difficulty processing what they hear accurately because they need more time to process each word being spoken. Students may think that the teacher is talking too fast when really their central nervous system processes at a slower rate.	Two areas of cognitive processing can especially affect students with mathematics learning disabilities. One area relates to language-based processing difficulties, which cause students to have difficulties making meaning of math representations and math manipulations that are presented through language-based information (e.g., verbal, written). A second area is visual-spatial processing, which affects students' abilities to accurately visualize math representations in space (e.g., how each side of a triangle might look three-dimensionally, coordinates on a plane).

Table 2.1 *Disability-Related Learning Characteristics That Affect Learning Mathematics (cont'd)*

Characteristic	Description	Effect on math success
Reading disabilities	Students who have reading disabilities face even greater difficulties with mathematics; they may have greater difficulties with problem solving (e.g., story problems and number skills) due to difficulties with the semantics that underlie language used in the classroom and numeracy/number sense.	Students who have reading difficulties will have difficulty making sense of mathematics-related texts and story problems because they do not understand the meaning of the context that supports the math. Students can struggle with both math-related vocabulary and vocabulary that is not math-related. Reading disabilities can also affect students' development of number sense when language is primarily utilized as the way to promote meaning with respect to numbers and their relationships.

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