

Support Neurodiverse Math Students with a Student-Specific Diagnostic/Prescriptive Model

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Abstract

The path to achieving numeracy, the mathematical equivalent to literacy, is dependent on math-specific abilities involving quantities and their comparison as well as the ability to express, decode and comprehend these mathematical relationships through oral and written language. Math is dependent on language (Bernabini L. (2021), and therefore individuals with issues that impede their ability to become literate are at risk of having these same deficits express themselves within the context of developing numeracy.

Developmental Dyscalculia, like dyslexia and dysgraphia, are classified as specific learning disorders in DSM-V. Studies on cognitive deficits show that children with math problems have a core deficit in their ability to process numerosity, both non-symbolic (:•:) and symbolic (5). Some hold that a deficit in numerosity coding is responsible for dyscalculia (Butterworth B. 2010). A core deficit in the phonological (sound/symbol) component of language is central to the difficulty dyslexics have with reading and spelling using the symbolic visual code. Labels like dyslexia and dyscalculia may garner services, but do not define the services necessary to promote effective learning by neurodiverse individuals.

Dehaene's Triple Code Model (Dehaene, S., & Cohen, L. 1995) will be used to describe the basis for our ability to count and process numerosity. The acquisition of numeracy involves the dynamic interaction between quantities, symbols, and the language used to represent them. The ability to connect quantities with their spoken and written labels predicts the development of arithmetic skills (Malone, S. 2019).

When complexity increases within the academic context of math or language beyond these core sound/symbol or quantity/symbol deficits, other individual-specific cognitive factors can become the limiting factor in acquiring numeracy. Understanding the dynamics behind the label, as well as the neurodivergent individual's constellation of cognitive metrics is essential to develop an effective educational plan of action.

A neurodiverse individual's math and language development are both tied to an intersection of underlying cognitive abilities. Defining these individual's strengths as well as resistance points within their ability to process symbolic versus non-symbolic visual information within the context of literacy can be useful in understanding how to program instruction with regard to math. Examples of these factors along with some diagnostic-prescriptive therapies will be presented.

Learning Objectives:

- As a result of this session, the participant will be able to list the three components of Dehaene's Triple Code Model that describes the basis for our ability to process numerosity.
- As a result of this session, the participant will be able to describe the symbolic visual code and the Analog Magnitude Representation Code (Nonsymbolic Quantity Code).
- As a result of this session, the participant will be able to explain the benefit of presenting visual information using the Nonsymbolic Quantity Code to all students, as well as both dyslexic and dyscalculic students.
- As a result of this session, the participant will be able to contrast whole-to-part versus part-to-whole teaching practices.

References

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