

## Things to Look (Out) for Regarding “The Science of Math”

There is a “science of reading” that represents a convergence of evidence in the literacy research community about effective reading instruction. It is largely a descriptive phrase that represents a large (but not perfect) consensus about the findings from decades of reading research.

In contrast, the “Science of Math” is a branding (with a website and hashtag) of approaches to math instruction based on research from part of the special education research community, which in some cases disagrees with the findings of research by the “mainstream” mathematics education research community. The “Science of Math” claims to be a “movement” and is a way people are labeling themselves as a part of this special education community rather than a representation of a consensus.

Some notable comparisons:

	“Mainstream” Math Education	“Science of Math”
<b>Location in the Literature</b>	Top journals in math education: <ul style="list-style-type: none"> <li>● Journal for Research in Mathematics Education</li> <li>● Educational Studies in Mathematics</li> <li>● Journal of Mathematical Behavior</li> <li>● ZDM Mathematics Education</li> <li>● Journal of Mathematics Teacher Education</li> <li>● Mathematical Thinking and Learning</li> </ul>	Journals commonly cited in “Science of Math:” <ul style="list-style-type: none"> <li>● Journal of Special Education</li> <li>● Journal of Learning Disabilities</li> <li>● Journal of Educational Psychology</li> <li>● Learning Disability Quarterly</li> <li>● Remedial and Special Education</li> <li>● Developmental Psychology</li> </ul>
<b>Theoretical Foundations and Research Methods<sup>1</sup></b>	Research published between 2013-2017: <ul style="list-style-type: none"> <li>● Relied mostly on constructivist and sociocultural theories of learning</li> <li>● Balanced quantitative (44%) and qualitative (41%) methods</li> <li>● Balanced research across grades P-5 (28%), 6-8 (15%), 9-12 (17%), and teachers (36%)</li> <li>● Addressed a wide range of math domains, including number and operations, algebra, geometry, statistics, calculus, and problem solving</li> </ul>	Research published between 2013-2017: <ul style="list-style-type: none"> <li>● Relied mostly on medical, behavioral, and information-processing theories of learning</li> <li>● Relied on quantitative (81%) over qualitative (13%) methods</li> <li>● Relied on participants from grades P-5 (51%) and 6-8 (20%) over 9-12 (13%) and teachers (9%)</li> <li>● Focused mostly on the topics of number and operations and problem solving</li> </ul>
<b>Instructional Approach</b>	Emphasizes student sense-making with teachers supporting students through sharing and comparing approaches and solutions. Sometimes thought of as “You Do (make sense of the problem on your own), We Do (make sense of the problem together)” before the modeling and practicing found in the “I Do, We Do, You Do.”	Emphasizes “explicit teaching,” described as a combination of modeling and practice, where teachers demonstrate step-by-step explanations for solving a math problem, then give students problem sets for practice in groups and individually. Commonly referred to as “I Do, We Do, You Do.”
<b>Conceptual Understanding vs. Procedural Fluency<sup>2</sup></b>	“Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems” (NCTM, 2014).	“When students have fluency with the operations, it makes higher-level math easier, provides less stress on working memory, and helps students build confidence in math. Instruction related to fluency must emphasize concepts alongside procedures” (Powell et al., 2022).
<b>Math Identity and Agency</b>	Promotes ideas of “productive struggle” and structures classrooms to help build positive student attitudes towards mathematics and beliefs in one’s own learning.	Promotes focus on skills and acknowledgement of effort but does not see connection between productive struggle or growth mindset and math achievement.
<b>Timed Assessments</b>	Discourages the use of timed assessments due to research showing that the anxiety it causes outweighs the practice benefits.	Encourages the use of timed assessments due to research showing that fluency and working memory benefit math performance.

<sup>1</sup> Lambert, R., & Tan, P. (2020). Does disability matter in mathematics educational research? A critical comparison of research on students with and without disabilities. *Mathematics Education Research Journal*, 32(1), 5-35. <https://doi.org/10.1007/s13394-019-00299-6>

<sup>2</sup> This is a topic where consensus could be reached. Neither group is advocating for the “drill-and-kill” approaches that were common in the 1970s and 1980s. NCTM’s position is trying to directly refute that approach, and is persuasive in its language, while Powell et al. (2022) claim that NCTM is perpetuating a myth about math learning.