

ADDRESSING THE MATH ANXIETY OF A STUDENT WITH A LEARNING DISABILITY DOING ALGEBRA

Casey Hord
University of Cincinnati
casey.hord@uc.edu

Anna F. DeJarnette
University of Cincinnati
anna.dejarnette@uc.edu

Keywords: Learning Disabilities, Math Anxiety, Algebra, Gestures, Strategic Questioning

To access many post-secondary educational and occupational opportunities, students with learning disabilities (LD) have to succeed in gatekeeper mathematics courses such as Algebra I (Achieve, 2015; Ysseldyke et al., 2004). While students with LD are often quite capable with academics at this level, these students often experience difficulties with memory and processing (e.g., working memory) that can contribute to difficulties with higher level mathematics (Marita & Hord, 2017; Swanson-Beebe Frankenberger, 2004). Math anxiety (i.e., a detrimental, emotional response to mathematics which can have a negative effect on mathematical performance) is a common challenge facing many students with LD and can exacerbate these students' issues with working memory (i.e., the processing, storing, and integration of multiple pieces of information) (Ashcraft & Krause, 2007; Baddeley, 2003; Nelson & Harwood, 2011).

Researchers have implemented interventions involving strategic use of visual representations—often in the form of gestures or diagrams—to support students' working memory as they engaged in mathematics that was likely to present challenges related to working memory (e.g., Hord et al., 2016; van Garderen, 2007). The use of these visuals can help students with LD to offload information from short-term memory (e.g., storing information in visuals), allowing students to focus attentional resources on critical thinking (Risko & Dunn, 2010; Xin, Jitendra, & Deatline-Buchman, 2005). In an exploratory study, Hord and colleagues (2018) described how a teacher addressed the needs of a student with LD and a high level of math anxiety; the teacher provided a combination of visual representations and emotional support at key moments of challenge while still pushing the student toward higher levels of understanding.

To further explore this topic, the researchers in this study conducted a qualitative case study of ten sessions of a tutor working on Algebra I content in a one-on-one setting with a student with a LD with high levels of math anxiety. His math anxiety was described in his school records (e.g., concerns of his father about his son's anxiety limiting his academic performance) and demonstrated by the student during tutoring sessions (e.g., frequent comments about his worries about finishing his work on time and avoidance behaviors such as changing the conversation to topics unrelated to the task at hand when he started to struggle with math). The tutor worked with the student on Algebra I topics such as systems of equations and comparing the slopes of two lines. To gauge the level of challenge she could present to the student, the tutor carefully considered the level of rapport and trust she had built with the student while monitoring the student's signs of fluctuating levels of math anxiety, current mathematical knowledge, and potential difficulties with working memory (Hackenberg, 2010; Hord et al., 2018). This poster will summarize our analysis of the interactions between the tutor's perceptions of the student's anxiety, the tutor's decisions about how to support the student, and the student's progress towards communicating his understanding verbally and in writing.

References

- Achieve. (2015). *ELA, math, and science course requirements across states* [data file]. Retrieved from <http://www.achieve.org/publications/ela-math-and-science-course-requirements-across-states>
- Ashcraft, M. H., & Krause, J. A. (2007). Working memory, math performance, and math anxiety. *Psychonomic Bulletin & Review*, 14, 243–248.
- Baddeley, A. D. (2003). Working memory and language: An overview. *Journal of Communication Disorders*, 36, 189–208.
- Hackenberg, A. J. (2010). Mathematical caring relations in action. *Journal for Research in Mathematics Education*, 41, 236–273.
- Hord, C., Marita, S., Ayaz, S., Tomaro, T., Gordon, K., Tunningley, J., & Haskins, S. (2018). Diverse needs of students with learning disabilities: A case study of tutoring two students in algebra. *Journal of Research in Special Educational Needs*, 18, 25–35.
- Hord, C., Marita, S., Walsh, J. B., Tomaro, T. M., Gordon, K., & Saldanha, R. L. (2016). Teacher and student use of gesture and access to secondary mathematics for students with learning disabilities: An exploratory study. *Learning Disabilities: A Contemporary Journal*, 14, 189–206.
- Marita, S., & Hord, C. (2017). Review of mathematics interventions for secondary students with learning disabilities. *Learning Disability Quarterly*, 40, 29–40.
- Nelson, J. M. & Harwood, H. (2011). Learning disabilities and anxiety: A meta-analysis. *Journal of Learning Disabilities*, 44, 107–110.
- Risko, E. F., & Dunn, T. L. (2010). Storing information in-the-world: Metacognition and cognitive offloading in a short-term memory task. *Consciousness and Cognition*, 36, 61–74.
- Swanson, H. L. & Beebe-Frankenberger, M. (2004). The relationship between working memory and mathematical problem solving in children at risk and not at risk for serious math difficulties. *Journal of Educational Psychology*, 96, 471–491.
- van Garderen, D. (2007). Teaching students with LD to use diagrams to solve mathematical word problems. *Journal of Learning Disabilities*, 40, 540–553.
- Xin, Y. P., Jitendra, A., & Deatline-Buchman, A. (2005). Effects of mathematical word problem solving instruction on middle school students with learning problems. *The Journal of Special Education*, 39, 181–192.
- Ysseldyke, J., Nelson, R., Christenson, S., Johnson, D. R., Dennison, A., Triezenberg, H., ... Hawes, M. (2004). What we know and need to know about the consequences of high-stakes testing for students with disabilities. *Exceptional Children*, 71, 75–95.