Special Learning Needs In Secondary Mathematics Classrooms

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The American education system is filled with diverse students needing many things to become educated. Reading Disabilities (RD) are one of the most diagnosed specific learning disorder and many studies have focused on these as the primary emphasis in academic learning disability research about among students. However, with the growing challenges facing students in math and science, more research is being dedicated to Mathematics Disabilities (MD). It is estimated that between 6% and 7% of school aged students have an MD, some are diagnosed while others are not (Swanson, Jerman, and Zheng, 2009). Between 1988 and 2006 only 15.9% of articles in special education journals targeted MD's, outnumbering math studies five to one (Bottge, Toland, Gassaway, Butler, Choo, Griffen and Ma, 2015). This is concerning because Geary (1999) suggest that MD's may be as common as RD's and these are not being studied by researchers. One study in particular focused on the combination of RD's and MD's to suggest possible solutions for helping those who have RD's avoid problems in mathematics.

Enhanced Anchored Instruction (EAI) is an instructional strategy similar to problem-based learning. Students are presented with an authentic, real world problem to anchor their thinking and then use mathematical skills and problem solving to find a solution. Through the process, the anchor provides a method for teachers to plan multiple types and levels of instruction. Students who struggle in mathematics often have difficulty solving smaller problems that help strong math students solve larger problems (Bottge et al, 2015). Research has shown that practicing abstract concepts alone (such as adding fraction) does not increase the skills of some students, but rather providing a model to directly teach fractions, students working memory would not be overloaded and students could access the material (Bottge et al, 2015). Anchored instruction in combination with traditional formative assessment techniques have been suggested

to increase students learning problems with mathematics over a class with traditional teaching and formative assessment practives.

The results of the Bottge et al., (2015) study showed that students both with and without MD's made greater performance with EAI, however, those with MD's improved four points more than those who did not previously have a MD. (Further, this study showed that

> *Once [students] have learned the basics of the skills and concepts supporting their use, students can gain more practice and facility while working on anchored problems. Previous studies have shown that expecting students with MD to develop competence in both areas simultaneously can depress performances in each area (Bottge et al., pp. 172, 2015).*

While the results did not produce results on commercially developed standardized tests, students with MD's contributed to anchored problems by providing background information and engaged more in the activity than their counterparts in the control group (Bottge, 2015).

Swanson, Jerman and Zheng (2009) support that for cognitive tasks, children with MD's do not perform as well as their same-age peers. Swanson et al. (2009) studied four subgroups from the population; students with MD's, students with RD's, students with both RD's and MD's, and normally achieving students. They compared the effect size to measure the severity of mathematical difference. Swanson (2009) found no supporting evidence to conclude that the variation in reading levels moderated comparison between children with MD's and those without. Since there is little connection between students with RD's and students with MD's, Swanson et al. (2009) sought to explain why there were cognitive deficits among children with MD's in relation to the average achieving and poor reading students. The results, students with challenges in mathematics were more likely to suffer from memory deficits.

Complex math tasks, such as word problems, have been documented by numerous studies to challenge students with MD's. However, this is not because of numerical deficits but both phonological (hearing) and executive processing (cognitive) deficits (Swanson et al., 2009). In a study of students and working memory (the process in the brain that controls current thoughts), students with MD's displayed cognitive deficiencies in their math skills compared with average achieving students. The deficiencies were most evident in working memory tests where students were asked to perform counting and digit-recall more than other cognitive recall tasks.

The studies selected and the conclusions they make are important for mathematics teachers to consider when working with students who have MD's. I chose this topic because I believe it is important for teachers to understand the challenges faced by students, especially if a cross-curricular skill (such as reading) *may* affect the teacher's ability to educate students in mathematics. By reading recent research about these topics, I was able to understand that because students with MD's are very common but often undiagnosed, I will need to assess how to best meet the needs of my students whether they have a formal diagnosis or not. The problems in classes are not because of reading disabilities (however these research articles make no claims about literacy and access to word problems). Since much of the cognitive challenges students face with MD's are numeracy and ability to reason with numbers, teacher should approach tasks more visually and relate to the real world authentically as suggested by Bottge et al. (2015).

I learned that there is research evidence to suggest that problems should be anchored in authentic, problem-based situations. I support this practice and I am working to incorporate more anchored instruction into my lesson plans. Since both of these articles conducted research, the evidence is difficult to refute. Both make strong cases and point out potential flaws in conclusions or assumptions made.

References

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