# Meta-Analysis on Math Interventions

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Summary:

A meta-analysis was conducted to combine findings of multiple interventions studying mathematics proficiency in students with learning disabilities. This study examined multiple instructional components and their effect on student performance. The study was conducted to enhance learning outcomes of students with learning disabilities in mathematics courses, as there is a great need for new and effective approaches. As math instruction has not always been at the forefront "in the field of instructional research on students with learning disabilities" (Gersten, Chard, Jayanthi, Baker, Morphy & Flojo, 2009, p. 1203), it is more important than ever to find effective methods in teaching math to this population. This meta-analysis works to analyze and synthesize findings to discover the most effective practices that were used throughout 42 interventions.

After examining multiple practices, the authors found several key components that should be incorporated into math instruction when teaching students with disabilities. As in many special education programs, explicit instruction is highlighted (Gersten et al., 2009). Those who used explicit, clear plans and guides in their instruction showed significant positive effects. Along with incorporating explicit instruction, visual representations were found to be a positive component used in instruction when combined with other practices. Carefully planning the sequence of examples and allowing students to verbalize their thoughts were also found to be effective. Teachers should provide continuous feedback to students and have a positive rapport. Peer-assisted instruction, however, was not found to be as successful when used with this population (Gersten et al., 2009). It should also be noted that the use of heuristics in solving problems showed a significant influence on student performance by addressing the lack of ability in students to organize abstract information and remember organizational schema. The authors

believe that more research must be conducted on the topic to support all findings. Along with the instructional components mentioned, the authors believe that instructors should focus on the common problem areas for these students in math including, “word problems, concepts and procedures involving rational numbers, and understanding of the properties of whole numbers such as commutativity” (Gersten et al., 2009, p. 1233).

Analysis:

This analysis was completed in hopes of improving the performance of students with learning disabilities in math. This analysis studied the math interventions or “instructional practices and activities designed to enhance the mathematical achievement of students with LD” (Gersten et al., 2009, 1205). This study focused on individuals with learning disabilities and how different interventions affected their academic achievement. Six instructional approaches were listed in the analysis including, explicit instruction, use of heuristics, student verbalization of reasoning, use of visual representations, range/sequence of examples and other instructional/curricular variables. For this study, explicit instruction included a step-by-step strategy for solving the problem, specific for a set of problems that students should follow exactly as the teacher demonstrates. A heuristic was defined as, “a method or strategy that exemplifies a generic approach for solving a problem” (Gersten et al., 2009, p. 1210). Student verbalizations, also known as “think alouds”, allow students to discuss their thoughts without getting overwhelmed and confused. Visual representations in this study focused on those that students had to use while solving the problem or ones that the teacher used during the initial demonstration of specific problems. Range and sequence of examples referred to either a specified pattern of examples (ie: easy to hard) or variation in the range of examples (Gersten et

al., 2009). The sixth component was included in case of the use of other instructional methods that were not listed in the five main interventions.

Assessments and feedback were given to both teachers and students on their performances. Teachers received feedback on either their students' progress and/or their instructional needs. Students received feedback on their performance, engagement and sometimes specific goals were addressed. This study also evaluated the effect of multiple instructional methods used at once. When examining this data, it was discovered that the use of visuals on their own did not have a major impact on student performance. However, when combined with other instructional components they were found to have a positive impact on student learning. All instructional components produced significant impacts on student performance except the use of peer-assisted learning and student goal setting and measuring. Out of all instructional components highlighted, those using heuristics and explicit instruction yielded the most significant effect.

Application:

After concluding this analysis, it is important to know how to incorporate effective methods into teaching practices. Explicit instruction, being one of the most influential practices used, should be considered by all teachers. Explicit instruction can be beneficial to students with learning disabilities because it gives them clear, set directions to follow and can help with their lack of organization in solving math problems. It is important to note that visual representations had little impact when used alone. Therefore, when using visuals, teachers should incorporate them with other instructional methods as well. The use of heuristics is valuable to mention

because of its significant impact on student outcomes. Heuristic strategies mentioned in the article include instructions like “Read the problem. Highlight the key words.” (Gersten et al., 2009, p. 1210) etc. These are not problem specific as explicit instruction is and can be helpful reminders to students with learning disabilities. Along with using appropriate instructional approaches, teachers should also provide students with helpful feedback in a positive manner. Students with learning disabilities benefit from positive encouragement and reinforcement. Not only should teachers give students feedback, but they should also use assessments to highlight specific student needs, misunderstandings and to improve their own instructional methods. Teachers can implement the various interventions mentioned in this article by staying up to date with changing trends, researching new studies and discussing effective strategies with other teachers. These interventions should also be considered based on the specific student and their individual needs. As students are so diverse in their abilities and learning needs, teachers should continue to use differentiated instruction and attempt to incorporate the interventions mentioned in the study.

# References

Gersten, R., Chard, D. J., Jayanthi, M., Baker, S. K., Morphy, P., & Flojo, J. (2009). Mathematics instruction for students with learning disabilities: A meta-analysis of instructional components. *Review of Educational Research, 79*(3), 1202-1242. Retrieved from https://www-jstor-org.ezproxy.liberty.edu/stable/pdf/40469093.pdf