**Combining Mind, Brain and Education to Understand Individual Differences in Mathematical Development: On the Importance of Representing Number.**

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**Action Item I – – Investigate Distance Effect.** Look at distance effect in distances larger than 3 using a mixed numerical representation format. Look at other non-symbolic representations. Different dot sizes might be overwhelming and a variable; distance effect for numerals initially may be the effect is more about automatic access to that magnitude representation rather than difficulty of problem.

**Action Item 2 – Mapping Between Symbols and Their Quantities.** What is causality of symbolic processing? Explore to what extent a precise representation of quantity drives a more precise representation of symbols. Explore to what extent symbols themselves drive enhancement of non-symbolic representation. Investigate links between precision of representation and the types of stimuli used to date. The direction of causation is still unproven. What effects can training of symbolic magnitude processing have on subsequent development of arithmetic? Include studies of typical developing children in isolation.

**Action Item 3 – Dyscalculia & Math Difficulties.** Increase the number of participants with math difficulty. Investigate the neural correlates specific to mapping of symbolic and non-symbolic processing in children with developmental dyscalculia. Look at double digit processing in students with dyscalculia. Look at number line estimation, place value and the way students with dyscalculia study. Need common operational definition of developmental dyscalculia.

**Action Item 4 – Specific Mathematical Processes.** Moving down the number line has implications for fractions, which is predictive of algebra. There is very little data on this. Need studies of instruction on moving down the number line including subtraction of positive integers. Is there a system for processing ratio in the brain? -- Double digit processes a different way. Investigate how/if results generalize across larger numbers.

**Action Item 5 – Roles of Culture and Age.** Culture: Symbols are cultural construct; some countries place higher priority on mental math at early ages. Caution needs to be taken when looking at data in one setting and applying it in another. We need cross national comparison studies to see how curricula variables structure the brain system as it sets up the trajectory. Age: Investigate if changes seen via training are related to changes in the passage of time/grades and partition these out. Investigate latent effects of training (i.e. is it possible that the changes induced may not be immediately effective in producing an effect in something as complicated as a fluency or competency test.)

**Action Item 6 – Phonological Process.** Phonological differences exist in lower performing groups of typically developing children. Need more studies on association between reading difficulties and math difficulties, including studies on verbal phonological association. Investigate interventions similar to phonological processing tests. Investigate possible connection between the abstract symbol to meaning behind it (similar to phonological mapping assessments).

**Action Item 7 – Executive Functions**. Look at role of working memory; identify possible subgroups.