

PRE-SERVICE EARLY CHILDHOOD TEACHER'S REPRESENTATIONS OF QUANTITY RELATIONS: THE ROLE OF MATH MEDIATED LANGUAGE

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In this research we report on an emerging new construct for viewing cognitive connections between math and language termed Math Mediated Language (MML). This construct looks at pre-service early childhood teachers' sensitivity to the embedded mathematical meanings that are present in words representing operations, and quantity relations such as more, less or equal. Our inquiry focuses on early childhood educators' sensitivity to the mathematical meanings in these words and the role that those perceptions play in their ability to craft word problems for students.

In this study 54 Pre-service teachers were asked to write one word problem for each of eight separate illustrations in which the properties of a set of discrete units were changed from a start amount to an end amount. These illustrations were designed to emphasize either (a) increases or decreases of a set by individual units, (b) increases or decreases to a set by grouped units or (c) simply joining or partitioning the discrete units of a set. The participants displayed 57% more representational discrepancies between their word problem and its illustration when the illustration emphasized changes in grouped rather than individual units. This indicated a greater difficulty with constructing word problems for multiplicative mathematical structures than additive ones. Our poster will provide examples of the word problems that were written by the participants and a more detailed qualitative analysis of the types of discrepancies that were coded to provide a richer picture of these data.

To investigate the hypothesis that these difficulties could be linked to the participants' concepts of MML, a 50 item survey known as the Mathematical And Verbal Educational Research Inventory Questionnaire (MAVERIQ) was designed to illustrate their sensitivity to (a) primary terms and synonyms for the four operations, (b) quantity relations, such as more, less, and equal, and (c) distracter terms representing non mathematical emotional states such as happy sad or angry. Likert scale ratings of the degree to which the participants perceived these terms as linked to mathematics were collected and synthesized to create an MML sensitivity scale that excluded the distracter terms and combined ratings of all mathematical terms and synonyms. A regression analysis in which errors were held constant revealed a significant interaction effect $F(7, 19) = 3.661$ $p < .05^*$ that associated high levels of MML sensitivity with high usage rates of multiplicative but low rates of additive operations in their written word problems. This suggests that MML is an important component in the ways that pre-service teachers interpret mathematical representations of quantity, and for the classroom content that they construct.