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Wilhelm, Jennifer; Matteson, Shirley; She, Xiaobo

Investigating preservice teachers' understanding of balance concepts utilizing a clinical interview method and a virtual tool.

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Summary: Our study was enacted in university mathematics education classes in the USA with preservice teachers (PSTs). This research focused on PSTs' interview responses that were used to assess their understanding of balance when challenged with tasks involving virtual manipulatives. Siegler's rules were used in analyzing PSTs' responses to balance tasks to help determine each PST's level of abstraction achieved regarding balance, equilibrium, or equivalence. Specifically, the data were analyzed regarding 3 different aspects: (a) the PSTs' understanding of balance, (b) what previous knowledge was exhibited by the PSTs throughout the enactment of the tasks, and (c) the mathematics utilized by the PSTs as they problem-solved with the virtual balance applet. The results showed PSTs relying on visual cues to implement procedures that were often inappropriate for the task at hand. When confronted with missing value balance tasks, 47 % of the PSTs attempted an incorrect procedure using direct proportions, and some (35 %) employed an incorrect fractional method. One PST systematically solved tasks, where he invented an inverse proportions model. However, most interviewees relied on guess-and-check reasoning. Implications of this study advise the need for purposeful experiences within education programs that lead to better connections across disciplines of big ideas such as balance.

Classification: M59 C39 U59 U79

Keywords: balance; big ideas; clinical interview; mathematics and science integration; physics education; pre-service teachers

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