

ZMATH 2016f.01223

English, Lyn D; Watson, Jane M

Exploring variation in measurement as a foundation for statistical thinking in the elementary school.

Int. J. STEM Educ. 2, No. 1, Paper No. 3, 20 p., electronic only (2015).

Summary: Background: This study was based on the premise that variation is the foundation of statistics and statistical investigations. The study followed the development of fourth-grade students' understanding of variation through participation in a sequence of two lessons based on measurement. In the first lesson all students measured the arm span of one student, revealing pathways students follow in developing understanding of variation and linear measurement (related to research question 1). In the second lesson each student's arm span was measured once, introducing a different aspect of variation for students to observe and contrast. From this second lesson, students' development of the ability to compare their representations for the two scenarios and explain differences in terms of variation was explored (research question 2). Students' documentation, in both workbook and software formats, enabled us to monitor their engagement and identify their increasing appreciation of the need to observe, represent, and contrast the variation in the data. Following the lessons, a written student assessment was used for judging retention of understanding of variation developed through the lessons and the degree of transfer of understanding to a different scenario (research question 3). **Results:** The results were based either on the application of the hierarchical SOLO model or on non-hierarchical clustering of responses to individual questions in the student workbooks. Students' progress throughout the lessons displayed a wide range of explanations for the estimate of a single student's arm span, general surprise at the variation in measurements, and a large variety of hand-drawn representations based on the values or frequencies of measurements. Many different representations were also created in the software for the single student measurements and for the comparison of measurements for the two scenarios. Although the students' interpretations of their plots were generally more basic than sophisticated, the results of the assessment indicated that many students had developed the ability to transfer their appreciation of variation to another context and could clearly explain the meaning of variation. **Conclusions:** The findings highlight the importance of an early focus on variation and distribution, with meaningful activities that motivate students to conduct and observe measurements, together with creating both hand-drawn and software representations to relate their experiences.

Classification: K42 F72

Keywords: elementary school; graphical representations; measurement; statistical thinking; variation
doi:10.1186/s40594-015-0016-x