Levels Of Line Graph Question Interpretation With Intermediate Elementary Students Of Varying Scientific And Mathematical Knowle.

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Keywords
science education, mathematics education, graphing, data analysis, elementary education, protocol analysis, student cognition

Abstract
This study examined how intermediate elementary students’ mathematics and science background knowledge affected their interpretation of line graphs and how their interpretations were affected by graph question levels. A purposive sample of 14 6th-grade students engaged in think aloud interviews (Ericsson & Simon, 1993) while completing an excerpted Test of Graphing in Science (TOGS) (McKenzie & Padilla, 1986). Hand gestures were video recorded. Student performance on using an assessment rubric created from previously cited factors affecting students’ graphing ability. Factors were categorized using Bertin’s (1983...
levels. The assessment rubric was validated by Padilla and a veteran mathematics and science teacher. Observational notes were also collected. Data and Bowen's semiotic process of reading graphs (2001). Key findings included differences in the use of heuristics, self-generated questions, science knowledge, and self-motivation. Students with higher prior achievement used a greater number and variety of heuristics and more often chose appropriate heuristics. They also monitored their understanding of the question and the adequacy of their strategy and answer by asking themselves questions. Most used their science spontaneously to check their understanding of the question and answers. Students with lower and moderate prior achievement even when it was not useful for answering the question and their questions. In some cases, if students with lower prior achievement their answers in the context of their science knowledge, they recognized their errors. One student with lower prior achievement when she thought the questions were too difficult. In addition TOGS in one of three ways: as if they were mathematics word problems, science data to be analyzed, or they were confused and had to guess. A second corroborated how science background knowledge affected graph interpretation: correct science knowledge supported students' reasoning, but it was not necessary for answering the question correctly; correct science knowledge could not compensate for incomplete mathematics knowledge; and incorrect science knowledge often distracted students when they tried to use it while answering a question. Finally, using Roth and Bowen's (2001) two-stage semiotic model of reading graphs, representative vignettes showed emerging patterns from the study. This study added to our understanding of how science content knowledge during line graph interpretation, heuristics and mathematics procedural knowledge, and perception attentions, motivation, and students' self-generated questions. Recommendations were made for future research in line graph interpretation in mathematics and science education and for improving instruction.

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