TYPES AND LEVELS OF SPATIAL REPRESENTATION IN THE DATA TASK OF GRADE 4-7 STUDENTS

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Representation is central to the study of mathematics (NCTM 2000). Representations are formed in the mind of the student via stimuli entering through the senses resulting in a mathematical idea or image that could create an object or schema. These images could be embodied in representations such as drawings, charts, graphs and symbols. Spatial representations include drawings, sketches, physical models, graphs, lists and tables.

Hundred and forty-four Grade 4-7 students completed three open-ended data tasks. They were asked to present the given data in each task on a poster. The tasks included numerical and categorical problems set in different contexts and have been adapted from the interview protocol tasks of Mooney, Langrall, Hofbauer & Johnson (2001) and Chick & Watson (2001). The aim of the investigation was to see what types of spatial representations students will use spontaneously and on what level of spatial representation according to the SOLO Taxonomy (adapted from Biggs and Collis, 1982, 1991) the responses are. The term graph was therefore not used in the wording of the tasks. Student responses were categorised according to the type and level of spatial representation of the data. Ten different types of spatial representations of the statistical data were identified. Two clusters were identified in a hierarchical cluster analysis of the student responses in all three data tasks.

The main distinguishing characteristic in the two clusters was the sophistication of responses. One group favoured less sophisticated responses like lists, or the use of random or organised pictures/shapes/names/numbers. The other group used more sophisticated spatial representational types with an overwhelming preference for bar graphs. The levels of spatial representation were categorised according to the SOLO taxonomy. Students in cluster 1 responded in the concrete-symbolic mode (CS) linked to multi-structural and relational cycles. Student responses in cluster 2 were mainly in the uni-structural (U) and pre-structural (P) cycles of the concrete-symbolic mode with some responses in the multi-structural cycle.

References

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