MODELING AND MULTIPLE REPRESENTATIONS IN DATA TASKS

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Modeling is a process developing higher order thinking skills with which events from the real world can be modeled in order to describe them, make sense of them, use them to solve problems and to predict how other systems or models can be understood. Modeling is closely linked to representation (Dossey et al, 2002; Lesh et al, 2002), being part of the process and the end product. A key idea of learning in statistics is to form and change data representations to arrive at a better understanding, a process that is called transnumeration (Wild & Pfannkuch, 1999). In this process of transnumeration, representational fluency plays a crucial role. Representational fluency involves the ability to represent a problem in more than one way and to be able to translate fluently between different representations. Young children exhibit intuitive modeling skills to analyse and solve problems and their models become accessible to others to the degree that internal and external representations of these models become accessible. Real understanding will most likely emerge when learners are able to represent knowledge of a concept or skill in a number of different ways and can translate back and forth among these different representations (Gardner, 1991). Not only does representational fluency engender better communication of an individual's thinking and understanding to others, it also results in better understanding of one's own thinking.

In the research project described here the purpose was to elicit Gr 4-7 students' spontaneous representations in two data tasks to determine their arrangement types, representational types and level of statistical thinking. Twenty out of a hundred and forty four students created multiple representations for Task 1 and ten for Task 2. Almost all of these learners created two representations. The only learner who chose to represent either task in more than two ways gave four different representations of Task 1. No Grade 5 learner used multiple representations, while most of the multiple representations were produced by Grade 6 learners (67%). Grade 4 and 7 learners produced an equal number of multiple representations (13,5% for each grade). The second representations of these multiple representational sets of Task 1 were all on a higher statistical level than that of the first and six of the ten for Task 2 also had a second representation on a higher level. Multiple representations in which the second representation is on a higher level than the first are examples of successful modeling. For Task 2 four of the ten sets of multiple representations consisted of two inappropriate representations each, pointing to unsuccessful modeling. The use of multiple representations is associated with good performance and contributes to the development of higher order thinking skills (Cox and Brna, 1995).

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