Geleitwort

Among the claims that have been central to mathematical modelling research and teaching is that individuals follow quite distinctively different pathways when engaging in modelling. In contrast, researchers and theorists often used idealised modelling cycles (there are many) which are really normative descriptions of the iterative modelling process. Such descriptions have their place in theory development, in research particularly when investigating and interpreting modelling behaviour and in classroom teaching where they can be used as scaffolds by both students and teachers particularly when developing meta-knowledge about modelling. However, as much as they are able to enlighten us they also contribute to our ignoring of certain things that occur in classrooms when a particular modelling event occurs as these are seen as idiosyncratic to the individual and thus of less interest. The question still remains, however, what are the real pathways taken idiosyncratically by a particular individual when modelling? Early work by Oke and Bajpai (1986) using relationship level graphs showed that real modelling processes undertaken by modellers are far from linear, or unidirectional and most genuine workers in the field of mathematical modelling have adopted a cyclical view of the modelling cycle ever since but there has been little research since that time looking at this empirically. Thus the work by Rita Borromeo Ferri which includes her reconstructions of students' individual "modelling routes" during task solution in a variety of modelling tasks – a central and already well-known concept developed in the frame of her work – is more than timely. Borromeo Ferri takes a cognitive perspective attempting to gain insights into the minds of students and teachers engaged in modelling in the classroom. Taking a cognitive viewpoint her work gives support for empirical differentiation of modelling phases as: real situation, mental representation of the situation, real model, mathematical model, mathematical results and real results. The transitions between phases involve cognitive processes, in particular: understanding the task, simplifying or structuring the task, mathematising, working mathematically, interpreting and validating, respectively. The last of these completes the cycle back to the mental representation of the situation. The second and third require the input of extra-mathematical knowledge. Compared with the more common normative descriptions of the phases, taking a cognitive perspective as data from these phases and transitions are interrogated, more insight is possible into what is actually happening from the perspective of the modelling individual whether they be the student engaged in the modelling or the teacher orchestrating the modelling activity. In the coming pages the author of this book will carefully pare away the film that has made these processes opaque to many of us from a research perspective for many years. It thus will be of much value to all of us continuing to research and teach in this field.

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