

## Examining personal and contextual threshold concepts in academic numeracy

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Developing professional knowledge and skills in a university degree may require academic numeracy. Academic numeracy has been defined as “a critical awareness which allows the student to situate, interpret, critique, use and perhaps even create mathematics in context, in this case the academic context. It is more than being able to manipulate numbers or being able to succeed at mathematics” (Galligan & Taylor, 2005, p.87). In many professions specific academic numeracy needed contains troublesome knowledge for many students. In economics it may be understanding of the rate of change; in engineering it may be vectors and in nursing it may be multiplicative thinking. This presentation will describe academic numeracy concepts in one profession, that of nursing and discuss the possibility of some of these concepts being threshold or troublesome.

While not specifically using examples from nursing, Meyer and Land (2005, 2006) explain the notion of threshold concepts as conceptual gateways that lead to previously inaccessible and troublesome way of thinking about something. These gateways may be ‘*transformational, irreversible, and integrative*’. They may also be *bounded* and *troublesome* (Meyer & Land 2005, pp. 373-374). In nursing numeracy the ability to deliver drugs correctly are linked to understanding of particular concepts in mathematics, especially multiplicative thinking. If nurses are able to use multiplicative thinking competently, confidently and flexibly in nursing contexts then they have shown numerate behaviour. For some students this behaviour may be threshold as it may hold for them a significant shift in perception, a new view of the interrelatedness of mathematical concepts such as fractions and decimals, and this ability is unlikely to be forgotten. While some concepts may be obviously threshold in mathematics, such as the concept of number itself, others exist at the personal ability level. It may be that any concept at any level of mathematics learning could be threshold to an individual person.

Therefore for some nursing students, relearning multiplicative reasoning may provide a gateway that allows understanding of other aspects of mathematics such as proportional reasoning, percentages and fractions all of which have been related to nursing numeracy skills (Hilton, 1999)

There is no doubt that some of these mathematical concepts are very troublesome to many learners. When students are in this troublesome space, Meyer and Land call this ‘states of liminality’, a term adopted from seminal ethnographic studies of Turner 1969 (in Meyer & Land, 2005). Liminal states have three characteristics. First they may be transformative (change in state or status – perhaps becoming aware of how drug calculations are solved; even acting like a nurse). Second there may be a power dimension as learners gain new knowledge and status in the community – a nurse who can ‘do’ the drug calculations. Third, there may be oscillation between states, with regression to earlier status (pp. 23- 24). Moreover, in 2006 Meyers & Land suggested there may also be pre-liminal states where there was variation in students’ tacit understanding of a threshold concept. Looking at nursing students’ academic numeracy knowledge through liminal and pre-liminal states is of interest in this study.

This presentation will use data from a research study of nursing students as they aim to become more numerate. It will first highlight concepts that have proved difficult for nursing students. It will then outline a human development methodology (Valsiner, 1997) that helps to identify troublesome knowledge and threshold concepts and will particularly use liminal states in describing the journey of some students as they become more numerate. It will show that the results of the study assist in curriculum development and the method can be generalisable to other university settings where there is a need to develop students’ numeracy levels.

## References:

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