43rd MERGA Conference 2021
5 – 8 July 2021
National Institute of Education
Nanyang Technological University
Singapore

Mathematics Education Research Group of Australasia

MERGA 43: Quick Reads

The metaphor of transition
for introducing learners to new sets of numbers

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Is the natural number 7 rational? Is it complex? We argue that the answers to these questions relate to the ways numbers are taught. Commonly, a new kind of numbers is presented as an expansion of a previously familiar kind, which results in a nested image of the relations between number sets. The issues that this image entails have been documented (e.g., Kontorovich, 2018a, 2018b). In this short conceptual article, we introduce an alternative approach, in which one transitions between different numerical domains, some subsets of which are isomorphic (Zazkis, Mason, Kontorovich, 2021).

Transitions take place between distinct domains, situating the differences between them as an expected norm rather than anomality. For travelers, an appreciation of transition implies that the destination is foreign, and its mysteries are waiting to be discovered. It also means that the luggage carried from the port of departure should be selected carefully since not everything will continue to be useful. Overall, for the sake of a positive experience, transitioning learners had better be attentive and alert to the rules and costumes of the foreign terrain, as these are likely be different from the familiar. This is not to say that similarities between the new and the old will not be recognized. Such instances would be a pleasant surprise, enabling to leverage previously gained knowledge and experiences to act fluently in new circumstances.

The transition metaphor may be viable for introducing new kinds of numbers. Specifically, it may offer a cohesive frame to attune learners' mindsets to the encounter with new number-names, symbols, and operations; to enhance their readiness to adjust and make sense of new number rules; and to explain why some familiar mathematical truths should be lost in transition. Transition also provides a room to grow insights and appreciations of the familiar kind of numbers from the newly developed perspective.

We acknowledge that teaching with the metaphor of transition in mind is likely to come with issues. Supporting students in establishing productive relations between different kinds of numbers is probably among the first issues to emerge. Teaching experiments are needed to show what these issues can look like and how they can be handled. Furthermore, we believe that, for the learning of mathematics, it is useful for students and teachers to be able to flexibly switch between the metaphors of transition and expansion.

References

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