



Rethinking the Number Magnitude-Based Progression: A Critical Analysis of Place Value Development in Years 3-6

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Place value is a 'big idea' in number, yet many Primary School students struggle to deeply understand this critical area of the curriculum. Gaps in a student's understanding of place value have implications for their ability to think multiplicatively, move onto decimal place value and progress further in Mathematics. The research question this paper addresses is: Do the Australian Curriculum descriptors adequately describe the progression Year 3-6 students make in place value?

To effectively teach place value, teachers firstly require access to a quality, research-based assessment tool to determine each student's level of understanding. Next, teachers must determine the instructional tasks which will scaffold a student to take the 'next step' in their development. To do this efficiently a teacher must appreciate the progression students make when coming to understand place value. Across Australia, place value instruction is largely guided by the number magnitude-based progression presented in the current Australian Curriculum document (Version 9.0). In this curriculum, students are introduced to 2-digit numbers in Year 1, followed by 3-digit numbers in Year 2 and so on. A number-magnitude based progression suggests that to increase the complexity of place value instruction, you simply work with larger numbers. The aim of this paper is to use student data and the Place Value Developmental Progression (PVDP) created by Rogers (2014) to highlight the potential issues teachers face when guided solely by a number-magnitude based progression.

The paper presents data from 606 Year 3-6 students (ages 8-12) from two metropolitan Melbourne primary schools who completed the Place Value Assessment Tool (PVAT)*. The PVAT is a valid and reliable paper and pen assessment that was developed in PhD research using Rasch analysis (Rogers, 2014). Having completed the PVAT, each student's place value knowledge was categorized according to the associated Place Value Developmental Progression (PVDP). The paper highlights the wide range of whole number place value understanding present in each year level and encourages teachers to consider the need for a more nuanced approach to the teaching of place value. This includes considering the unique characteristics of each of the 6 aspects (Rogers, 2014) within place value and the different 'cadence' required to teach the content within each aspect.

*You can download the PVAT from www.numeracyteachersacademy.com/PVATFormA

Reference

Rogers, A. (2014). Investigating whole number place value assessment in Years 3-6: Creating an evidence-based Developmental Progression (Unpublished Doctoral Dissertation). RMIT University, Melbourne, Australia.

For more information, please refer to the following paper presented at the 45th Annual Conference of MERGA in July 2023.
Rogers, A. (2023). Rethinking the Number-Magnitude Based Progression: A Critical Analysis of Place Value Development in Years 3-6. In B. Reid-O'Connor, E. Prieto-Rodriguez, K. Holmes & A. Hughes (Eds.), *Weaving mathematics education research from all perspectives (Proceedings of the 45th Annual Conference of the Mathematics Education Research Group of Australasia)*. (pp. 419-426). Newcastle, Australia: The Mathematics Education Research Group of Australasia Inc.