Place Value

A place value system is one in which the position of a digit in a number determines its value. In the standard system, called *base ten*, each place represents ten times the value of the place to its right. Understanding place value is an essential skill for students to develop as it gives a meaning to the number.

Keywords: *place value, base ten, digits, number, numeracy, magnitude*

When students learn place value, they understand:

- The relationship between the places (e.g. ones, tens, hundreds, etc.).
- 10 in a place has the same value as 1 in the next place to the left.
- The position of a digit determines its value.
- "0" indicates there is none of a particular place and is used as a "place holder".
- The decimal point marks the distinction between whole numbers and parts of numbers.
- There is *symmetry* around any particular place, with each place to the left being ten times greater, and each place to the right being ten times smaller.

Students with Language Disorder may demonstrate difficulties with place value understanding for a variety of reasons, including:

- Difficulty understanding quantifying in groups of 10.
- Syntactical difficulties, resulting in digits being placed out of sequence, especially in larger numbers.
- Attentional and/or memory weaknesses, which impact upon a student's ability to store and process numbers. This process becomes more difficult as the number of digits increases.
- Poor executive functioning skills.
- Difficulties understanding the use of *zero* as a place holder.
- Visual perceptual difficulties.
- High cognitive demands required when working with numbers.

Strategies to assist students in understanding place value

- **Explicitly teach specific vocabulary associated with place value**, such as *more, less, between, before, after, next, groups, etc*. Please see our Language Disorder Australia Handout, *Pre-teaching (Primary or Secondary)* for further suggestions.

- **Compare and order numbers frequently.** Descending order is more difficult and requires much more opportunities for guided practice.

- **Make/represent numbers using a variety of materials, both proportional (e.g. MAB) and non-proportional (counters).** When using MAB, make numbers in both *canonical* form (e.g. 39 is 3 tens and 9 ones) and *non-canonical form* (e.g. 39 is 2 tens and 19 ones) *(see below)*.

Canonical representation *Students may be able to read number through relying on rote learning, rather than conceptual understanding. e.g. "4 tens and 2 ones = 42" (student may have rote learnt to write from left to right without conceptual understanding of the numbers)	
Non-canonical representation *Students must employ strategies to count/group before identifying number, thereby demonstrating better conceptual understanding. e.g. (top) "5 tens and 4 ones = 54" "10, 20, 30, 40, 50, 51, 52, 53, 54" (bottom) "2 groups of ten and 2 ones = 22" "10, 11, 12 …. 22" "10, 15, 20, 21, 22"	

- **Use colour coding** to help develop understanding of the base 10 principle. Each place value (ones, tens, hundreds, thousands etc.) is given a specific colour. This can assist students to focus on separate parts of the number at one time and, when working with two large numbers, can assist with partitioning of numbers. Please refer to our Language Disorder Australia Handout, *Colour Coding Numbers*, for further information and resources.

- **Use place value charts with speech prompts** to provide a structure for students when reading and writing multi-digit numbers. Explicit instruction on the use of the chart should begin with two-digit numbers and then gradually advance to larger numbers as the student becomes more capable. Please refer to our

4 digit place value board

Thousands	Hundreds		Tens	Ones
thousand	hundred	and	ty	

Language Disorder Australia Handout, *Colour Coding Numbers*, for further information.

- **Provide additional opportunities for students to develop automaticity and consistency in reading and writing multi-digit numbers**. Consider using iPad apps to reinforce this skill.

- **Practice counting forwards and backwards in place value chunks,** (e.g. in tens), in addition to bridging over decades (e.g. 65, count on 10).

- **Carefully consider the language used** when teaching place value to students with Language Disorder. Terms such as "hundreds," "tens," or "ones" are not often used outside of the classroom. Wherever possible, ensure these terms are related to real-life applications.

- When writing demands are too high for a student, consider **providing alternatives,** such as number tiles, so the student can focus on the number, rather than fine motor and handwriting demands.

- **Encourage students to chunk** when reading and writing numbers. This can be enhanced by the use of markers, such as commas, between place value chunks.

- **Explicitly teach renaming of numbers.** This can be difficult as it requires multiplicative thinking, therefore, use real life examples as much as possible. For example, one egg carton contains a group of 12 eggs.

Want to learn more?

To learn more about Language Disorder and how to support children and young people for whom language is their primary disorder, please **contact us**. Language Disorder Australia provides holistic, innovative and effective therapy, education and support services and has a transdisciplinary team of speech pathologists, occupational therapists, educators, psychologists and physiotherapists.

Contact: 1300 881 763 or **hello@languagedisorder.org.au**

Website: **languagedisorder.org.au**

References

Fazio, Barbara B. (1996). Mathematical Abilities of Children with Specific Language Impairment: A 2-Year Follow-up. *Journal of Speech and Hearing Research, 39*(4), 839-49.

Gunningham, Sue. (2011). Teaching place value. *Prime Number, 26*(2) 7-9.

Imbo, I., Vanden Bulcke, C., De Brauwer, J., & Fias, W. (2014). Sixty-four or four-and-sixty? The influence of language and working memory on children's number transcoding. *Frontiers in Psychology*, *5*, 313. http://doi.org/10.3389/fpsyg.2014.00313

Rogers, Angela. (2017). Teaching place value: A framework. *Prime Number, 32*(1), 19-21.

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