

Developing Place value knowledge

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Essential notions of place value : the relative spatial positions of digits communicate magnitude . Place value concepts require students to co-ordinate two aspects of quantity; the quantity associated with each digit, and the quantity associated with each place.

As children progress through mathematics, the knowledge they need to link with place value changes:

- at early primary, that the position of a digit in a number contributes to its meaning,
- at middle primary, the generalization to numbers beyond real-life experiences, eg 3,623,598,
- at late primary, generalization to decimal numbers, eg 6.3, 6.003, 6.30, and other bases,
- at the secondary level, generalization to standard form and algebra

Types of Difficulty Displayed by Underachievers These include:

- (1) distinguishing between the meanings of different places.
- (2) difficulty generalizing and applying place value properties to symbolic statements,
- (3) difficulty generalizing place value properties to numbers larger than 1,000

The Importance of Acting on Grouped Materials. Many students need experience

- physically grouping and manipulating grouped quantities
- describing these manipulations, and to record them pictorially
- visualizing ten-grouped quantities.

The physical manipulation and oral discussion is important; without it, students may be unable to make sense of quantities such as "three tens" or "two ones".

Sequence for Teaching Place Value Skills: work on place value skills for the ranges:

10 - 99 100-999 1,000-9,999 10,000-1,000,000, >1,000,000, 1-dec place 2-dec pl

Place Value Skills Within Each Range Within each range teach place value using quantities, and gradually abstract them:

- (1) a new concept is introduced in familiar language and in real-life episodes.
- (2) symbolic notations are introduced and students generalize from real-life episodes.
- (3) symbolic notations are used in the absence of real-life events; students visualize the ideas.

Selecting the Most Appropriate Concrete Model for Place Value :

1. Discrete materials: These make the least intellectual demands on students.
2. Linear materials: Demand that students identify patterns in linear materials.
3. Areal materials: Demand recognition of patterns using area- based materials.
4. Ratio-type materials: Pattern based on definition; no relation between relative sizes of materials and the ten factor.
5. Abacus-type materials: Position of element indicates quantity intended.