
ANNUAL TEACHERS' TRAINING COURSE YEAR 2007 SEMESTER 1

MATHEMATICS

Introduction

Developing a solid mathematical foundation from pre-kindergarten through year one is essential for every child. In these grades, students are building beliefs about what mathematics is, about what it means to know and do mathematics, and about themselves as mathematics learners. These beliefs influence their thinking about, performance in, and attitudes toward, mathematics and decisions related to studying mathematics in later years.

Children develop many mathematical concepts, at least in their intuitive beginnings, even before they reach school age. Infants spontaneously recognize and discriminate among small numbers of objects, and many preschool children possess a substantial body of informal mathematical knowledge. Adults can foster children's mathematical development from the youngest ages by providing environments rich in language and where thinking is encouraged, uniqueness is valued, and exploration is supported.

Understanding Place-value: Practical and Conceptual Aspects

There are at least five aspects to being able to understand place-value, only two or three of which are often taught or stressed. The other two or three aspects are ignored, and yet one of them is crucial for children's (or anyone's) understanding of place-value, and one is important for complete understanding, though not for merely useful understanding.

1. Learning number names (and their serial order) and using numbers to count quantities, developing familiarity and facility with numbers, practicing with numbers --including, when appropriate not only saying numbers but writing and reading them, not in terms of rules involving place-value, etc., but in terms of just being shown how to write and read individual numbers (with comments, when

- appropriate, that point out things like "ten, eleven, twelve, and all the teens have a '1' in front of them; all the twenty-numbers have a '2' in front of them" etc.)
- without reasons about why that is,
2. "Simple" addition and subtraction", meaning addition and subtraction with regard to quantities children can learn to add and subtract just by counting together at first and then, with practice, fairly quickly learn to recognize by memory. For example, children can learn to play with two dice and add up the quantities, at first by having to count all the dots, but after a while just from remembering the combinations (number bonding).
 3. Developing familiarity through practice with groupings, and counting physical quantities by groups (not just saying the "multiples" of groups -- e.g., counting things by fives, not just being able to recite "five, ten, fifteen,..."), and, when appropriate, being able to read and write group numbers --not by place-value concepts, but simply by having learned how to write numbers before. Practice with grouping and counting by groups should, of course, include groupings by ten's,
 4. Representation (of groupings). Teaching place-value is not just merely to show the children the columnar place-value, but to start them out with more psychologically accessible group representations. Let the children begin with the kind of representational group values that children seem to have no trouble with -- such as colors. Only one needs not, and should not, talk about "representation", but merely set up some principles like "We have these two different color chips, blue ones, and red ones. Whenever you have ten red ones, you can exchange them for one blue one or *vice versa*."
 5. Specifics about representations in terms of columns. Columnar representation of groups is simply one way of designating groups. But it is important to understand why groups need to be designated at all, and what is actually going on in assigning what has come to be known as "place-value" designation. Groups make it easier to count large quantities; but apart from counting, it is only in writing numbers that group designations are important.

Reference

1. National Council of Teachers of Mathematics (2004). "Overview: Prekindergarten through grade two." <http://standards.nctm.org/>
2. Richard Garlikov (2000). "The concept and teaching of place-value." <http://www.garlikov.com/PlaceValue.html>